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November 10, 2016

VIA FEDEX

RECEIVED NOV 14 2016

Sarah Flanagan
Regional Counsel
United States Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007-1866

Re: Lower Passaic River Study Area
Former Givaudan Fragrances Corp. Facility,
125 Delawanna Avenue, Clifton, NJ
Supplemental Response to 104(e) Request for Information (November 2016)

Dear Sarah:

Givaudan Fragrances Corp ("Givaudan") herein provides additional information to supplement its prior submissions to the United States Environmental Protection Agency ("USEPA") in response to various Requests for Information pursuant to 42 U.S.C. § 9604(e) related to the former Givaudan facility in Clifton, New Jersey (the "Clifton Site"). The initial 104(e) request was served upon Givaudan on September 15, 1983 and responded to by letter dated October 26, 1983. A second 104(e) request was served upon Givaudan on May 13, 2004 and responded to by letters dated July 12, 2004 and June 27, 2006. A third 104(e) request dated September 2, 2009 was responded to in two parts by letters dated October 14, 2009 and December 3, 2009. These prior submissions included various documents and exhibits concerning the Clifton Site.

Enclosed you will find Givaudan's Supplemental 104(e) Response dated November 2016, as well as two (2) binders containing the exhibits referenced within the Supplemental Response. Also, for your convenience, we have provided electronic copies of this submission on two (2) disks. Please note that two exhibits, Tab No.'s 3 and 45 in Binder Volume 1, have been withheld and designated as Confidential Business Information and are being provided to you under separate cover pursuant to 42 U.S.C. § 9604(e)(7)(C). Givaudan reserves the right to provide additional information and documentation in response to the USEPA's 104(e) requests as such information and documentation may become available.

Finally, Givaudan requests a meeting with USEPA to discuss this information and the Agency's continuing work on the Source Investigation. Please provide us with proposed dates for a meeting at your earliest convenience. We look forward to meeting with USEPA. Thank you for your attention to this matter.

Sincerely,

William S. Hatfield
Director

Enclosures

GIVAUDAN FRAGRANCES CORPORATION
SUPPLEMENTAL RESPONSE TO 104(e) REQUEST FOR INFORMATION

United States Environmental Protection Agency ("USEPA") has issued several requests for information about the former Givaudan facility in Clifton, New Jersey (the "Givaudan Site" or "Clifton Site") with regard to the Lower Passaic River Study Area. USEPA's requests have sought information regarding the following general categories: the history of the former Givaudan Site, plant production information, liquid and solid waste management, permits, material and waste testing data, plant demolition, and remedial actions, with a specific focus on the compound identified as 2,4,5 Trichlorophenol ("TCP") and a product manufactured using TCP known as Hexachlorophene (a/k/a "G-11"). Givaudan's prior responses to USEPA were based upon the information and data then available. Givaudan hereby supplements its prior 104(e) responses dated October 26, 1983, July 12, 2004, June 27, 2006, October 14, 2009 and December 3, 2009 for the Clifton Site.

Since 2009, Givaudan has met with USEPA on several occasions and has exchanged correspondence concerning the former Clifton facility and its alleged nexus to contamination in the Lower Passaic River. USEPA has expressed interest in obtaining additional information related to the Clifton Site conditions over time, including the former plant process sewer system. Specifically, USEPA has sought confirmation of when the former Givaudan Site connected to the City of Clifton sewer system, which discharges to the Passaic Valley Sewer Commission ("PVSC") main trunk line that runs parallel to the Lower Passaic River along Route 21.

In an effort to respond to USEPA's requests, Givaudan has expended considerable efforts and resources to research and compile additional information concerning the former Givaudan Site. Those efforts included obtaining and evaluating additional historical aerial photographs, available historical sewer records, and other materials from public and other sources. The additional information gathered through Givaudan's efforts are provided in this supplemental 104(e) response and include:

(1) a collection of historical aerial photos and topographic information (with interpretative notes);
(2) additional sewer maps obtained from the City of Clifton and the New Jersey Department of Transportation ("NJDOT"), detailing when the sewer lines were installed in the area surrounding the former Givaudan site; and
(3) additional documents found in public and archived files related to other topics included in USEPA's requests for information.

Givaudan supplements its prior 104(e) responses with the enclosed binders, Volume 1 (Tab No.'s 1-55) and Volume 2 (Sewer Chronology, Exhibits A-T) (also provided via disk). The following is a summary of the former Clifton facility information and documentation provided in this supplemental 104(e) response.

HISTORICAL AERIAL PHOTOGRAPHY AND TOPOGRAPHIC REVIEW CONFIRMS NO SURFACE WATER DRAINAGE PATHWAY TO THE PASSAIC RIVER FROM THE FORMER GIVAUDAN SITE

Through private vendors and archived public sources, Givaudan obtained dozens of additional aerial photographs of the Clifton Site spanning the years 1931 to 2012 (*see* Tab 1 for all Aerial Photograph and Topographic Exhibits). An emphasis was placed on securing aerials that covered the early years of plant operations up through the 1970s. This information supplements the aerial photography submitted as part of the 2009 104(e) supplemental response. The source and scale of these photographs are noted within the Aerial Photograph Exhibits in the binder included with this supplemental response.

Several of these photographs include aerial stereo pairs, which allow a trained aerial photo interpreter to view greater detail to support the interpretations presented with the aerial photographs. There are also oblique aerial photographs that provide an additional viewing angle of the former Clifton site and the surrounding area. Based on the search conducted, the 1931 photograph is the earliest aerial available for the former Clifton Site.

In addition, the attachments include an 1870-1887 historical topography map (Aerial Photograph Exhibit 3), two aerial photographs that were photo digitized to obtain topographic information on a portion of the former Clifton site (Aerial Photograph Exhibits 19 and 24), and a 1979 aerial photograph that has been overlaid with the 1982 plant topography (Aerial Photograph Exhibit 32). Note that copies of Sanborn Maps for the years 1935, 1951, 1952, 1965, 1970 and 1984 are also provided for reference, which show the plant expansion over time (*see* Tab No. 36).

Aerial Photograph Exhibit 1 shows the plant at full build-out circa 1979, as well as the surrounding area. Plant building numbers and key roads around the plant are labeled for reference on this exhibit.

Aerial Photograph Exhibit 2 shows the dates on which Givaudan purchased the various lots that make up the entirety of the former Clifton Site, which includes buildings on both the north and south sides of Delawanna Avenue (the main east/west trending road that divides the plant property). However, the remainder of the aerial photography review focuses on the south side of Delawanna Avenue where production and waste management activities took place. As part of the aerial photo interpretation, the then current property line of the former Clifton Site at the time of the photograph is shown, illustrating actual ownership and conditions onsite and in the area surrounding the property at the time of the photograph. The property line transferred onto each photograph is based on the property title history and the City of Clifton title maps (*see* Tab No. 37). The property title history identifies the parcels that Givaudan purchased over time that encompass the former Clifton Site, beginning in 1924 and ending with the last purchase in 1978 for the south side and 1982 for the north side (*id.*).

Aerial Photograph Exhibit 3 is the 1870-1887 historical topography map. The red outline shows the boundary of the former Clifton Site and the yellow line shows the area where topography was developed using digital plotting on the 1954 photograph (Aerial Photograph Exhibit 18) and the 1961 photograph (Aerial Photograph Exhibit 23). Aerial Photograph Exhibit 32 shows the 1982 plant topography overlain on a 1979 aerial photo. The 1870-1887 topography shows that prior to any development, Delawanna Avenue and the rail line along the western boundary of the former Clifton Site were present and their location and orientation have not changed since that time. Both Delawanna Avenue and the rail line are at a higher elevation compared to the former Clifton Site. The configuration of River Road was the same from that time until it changed on the eastern side of the property when Route 3 and Route 21 were constructed between 1959 and 1961. Within the former Clifton Site boundary (inside the red line), the lowest elevation is to the south along the rail line at River Road, which low point remained the same throughout the development of the property. The area to the east/northeast is a natural topographic high that was partially excavated over time to allow for plant expansion, and the eastern bluff that remains there is the current location of a residential community, which is elevated approximately 20 feet above the former Clifton Site.

The area east of the former Clifton Site (within the yellow line) is topographically higher than the Givaudan Site and that elevation has remained the same over time. Using digitized topography, Aerial Photograph Exhibit 19 (1954 photo) shows that the River Road/rail line location is the low spot, with higher elevations to the east along River Road.

One key observation on all of the historical aerial photographs is that there is no visible channelized flow or surface drainage feature visible on or off of the plant property. The alleged existence of a possible surface water pathway that could have conveyed storm water flow from the former Clifton property directly to the Passaic River is *not* supported by the historical aerial photo review, or the digital topography analysis completed on the historical photos. There is no evidence of a defined drainage swale either on or off the property to the Passaic River in any of the historical aerial photos, and topographic relief is higher around the property and significantly elevated to the east, with the lowest elevation consistently identified at River Road and the rail line to the south.

There was no overland path for runoff to the east from the former Givaudan Site to the Passaic River. Aerial Photograph Exhibit 24 (1961 photo) provides digitized topography after the construction of Route 3/Route 21, which shows that fill material was used for construction of that roadways' current on/off ramps. The River Road/railroad area on the southern end of the plant remains the low point at the Clifton Site. Aerial Photograph Exhibit 32 shows the 1982 topography overlaid on the 1979 aerial photo, which confirms that the River Road/railroad area remained the low point at the Clifton Site. With higher elevations to the east, and the unchanged presence of Delawanna Ave. along with the railroad on the north and west sides of the plant, the only location for surface water runoff from the former Clifton Site would have been the juncture of River Road and the rail-road at the southern end of the plant. Surface water runoff (if any) only occurred during extreme precipitation events as storm water was collected in the onsite pond or percolated into the unpaved areas at the property. Any surface runoff would have been collected in the City of Clifton storm sewer system on River Road near the railroad underpass (*see* Tab No. 50).

FROM THE LATE 1940s THROUGH EARLY 1950s, THE FORMER CLIFTON SITE HANDLED PROCESS WASTEWATER ONSITE

The remaining aerial photographs document site development over time. Key observations include the presence of three enclosed water features on the Clifton Site. Two of these features are first visible on the 1947 aerial photograph (Aerial Photograph Exhibit 8): a thin elongated feature believed to be the Spent Acid Pit ("SAP") referred to in earlier submittals, and the area known as the storm water pond, which remains visible until the plant is closed. The third enclosed surface water feature is clearly visible on the 1949 Oblique (Aerial Photograph Exhibit 12), adjacent to the SAP and north of the storm water pond. That feature appears to be an impoundment that handled process waste water. By 1953 (Aerial Photograph Exhibit 16), the only surface water feature visible is the storm water pond. The SAP no longer contains standing liquid, and there is no remaining evidence of the third water feature. The occurrence and eventual disappearance of the SAP and third surface water feature support prior information submitted to USEPA that the plant used the SAP and third surface water feature to handle plant process waste water and possibly non-contact cooling water, while the storm water pond was consistently used for collecting rainwater until plant closure (*see* Tab No. 27, well driller logs confirming the use of onsite pits for liquid waste disposal in 1949). The documentation submitted to USEPA indicated that, prior to 1947, waste was discharged onsite into cesspools and pits. Some liquid waste (solvents) was also used as supplemental fuel in the plant boiler. The boiler house is visible on the 1947 photograph, and also may be present in the 1940 photograph.

In addition to the interpretation of aerial photography and the sewer chronology, Givaudan located a separate document from a well driller who did work at the plant, which confirms that plant waste was disposed into pits (e.g. the SAP and third water feature) (*see* Tab No. 27). Further, a 1951 Givaudan memo discusses the recovery of G-11 from the former waste pits (*see* Tab No. 48), which also supports the facility's practice of discharging and handling its process waste water from G-11 on site before the plant connected to the city sewer line on River Road by 1951-52.

THE GIVAUDAN SITE WAS CONNECTED TO THE CLIFTON CITY SEWER SYSTEM AS EARLY AS 1926 AND NO LATER THAN 1951/1952

As documented in prior submittals, the earliest engineering drawing referencing a plant sewer system for the Clifton Site is dated 1946. Until that time, the documentation indicates that process waste generated by the plant was disposed of in cesspools and pits, with some spent solvents used as supplemental fuel in the plant boiler. The installation of a dedicated plant sewer system in 1946 and the appearance of the SAP in 1947, followed by the development of a third surface water impoundment by 1949, supports the prior information that plant process waste water was initially all handled onsite. Also, an onsite storm water management system was evident by 1947 and is supported by the appearance of the storm water pond and a storm water conveyance system (1946 engineering drawing), which remained in use until the plant closed.

Regarding the Clifton Site's connection to the City of Clifton sewer system, Givaudan provides the following information along with some background documentation (*see also* attached Sewer Chronology with Exhibits A-T). The City of Clifton (formerly Acquackanonk Township) began the process of planning for a dedicated sewer system in the early 1900s. By 1911, a contract was in place with the Passaic Valley Sewerage Commission ("PVSC") to construct a sewer system that would connect to the main trunk line that PVSC planned to install parallel to the Passaic River. There is documentation in historical City of Clifton records that parts of the City had sewer access before the 1920s (*see* Tab No. 25). By the early 1920s, the City had passed several resolutions for the design and installation of a dedicated sewer system for the majority of Clifton. With the completion of the PVSC trunk sewer by 1921, the City began adding connections for the discharge of its sewage to the PVSC.

According to City of Clifton meeting notes, the majority of the City sewer system was in place and operating by 1927 (*see* Exhibit C to Sewer Chronology). Copies of sewer maps for the Delawanna area of Clifton, which include Delawanna Avenue, River Road and Oak Street in the vicinity of the former Givaudan Site, indicate that these sewers were installed by 1927. In 1930, the City passed Ordinance #989, which prohibited the discharge of sewage into the Passaic River or its Tributaries (*see* Exhibit H to Sewer Chronology). Subsequently, a series of ordinances were passed requiring hook ups by all businesses in Clifton to the City sewer when it was installed and establishing rates for sewer usage. A 1945 City Planning map shows that essentially the entirety of the City had both sanitary and storm sewers by that date (*see* Tab No. 51). There is no evidence to support any allegation that the City of Clifton sewer line could have discharged to the Yantacaw Pond, the Third River, or the Passaic River. The Clifton sewer system along Delawanna Avenue, River Road, and Oak Road was connected to the PVSC system by 1926-27.

In 1951-1952, an additional sewer line was installed on Delawanna Avenue to collect domestic sewage from the residential area constructed on the bluff to the east of the former Clifton Site. One of the drawings generated as part of this construction indicates that the Givaudan Site was already serviced by a City sewer (*see* Exhibit P to Sewer Chronology), which sewer line is believed to have been in place since 1926/1927.

The connection of the plant process waste stream (Outfall 001) to the River Road sewer system appears to have been made no later than 1951-52, and perhaps several years earlier. The City of Clifton sewer maps indicate that this stretch of River Road had sewer lines installed in 1927 (*see* Attachment E to Sewer Chronology). However, Givaudan did not have access to this area until it purchased Parcel 3 in 1939 (*see* Aerial Photograph Exhibit 2). The latest a sewer connection would have been made is 1951-52, as it coincides with the absence of the large rectangular surface water impoundment and the appearance of Building 74, which is identified as part of the Clifton Site's early waste water pre-treatment system (*see* Aerial Photograph Exhibit 14). Also, the SAP is no longer visible by the 1953 aerial photo and Building 83 is present, which is designated as a Waste Neutralization System (*see* Aerial Photograph Exhibit 16). A review of New Jersey Department of Transportation ("NJDOT") engineering drawings for the Route 3/21 project show that the former plant had connected to the River Road sewer before 1955 (*see* Exhibit T to Sewer Chronology). Based on these documents, Givaudan believes that the Clifton Site may have connected to the River Road sewer line as early as 1946, but no later than 1951-52. This conclusion is supported by the aerial photo documentation, the local ordinances in place, and the NJDOT engineering drawings, as well as facility documents.

As discussed above, based on the aerial photo interpretation, there was no defined surface water runoff or pathway from the Clifton Site to the Passaic River, and that plant process waste effluent was contained on the property prior to connecting to the City sewer system. Further, based on the historical sewer documentation, it is evident that the former Givaudan Site was connected to the Delawanna Avenue sewer line as early as 1927 and to the River Road sewer line as early as 1946, but no later than 1951-52. Additional support for this conclusion is contained within Tab No. 35, which includes 1953 correspondence related to Givaudan's agreement to repair sewer lines on River Road, and a reference to 1946 correspondence related to maintenance responsibility.

ADDITIONAL DOCUMENTS RELATED TO THE GIVAUDAN SITE OPERATIONS

In the course of reviewing archived information and other public sources, Givaudan located additional documents that are responsive to USEPA's prior 104(e) requests. The enclosed Binder

(Volume 1) includes those documents and provides an index and summary of each document. The following is a brief overview discussion of these additional reference materials.

GIVAUDAN'S MANUFACTURING PROCESS AND STRICT QUALITY CONTROLS ON ITS TCP FEEDSTOCK RESULTED IN MINIMAL (IF ANY) TCDD CONTENT

Additional information from published sources indicates that it was highly unlikely that Givaudan's G-11 manufacturing process generated TCDD because it used acidic conditions and low temperatures in its process (*see* Tab No.'s 23 and 26). Documents prepared by Dow state that TCDD may be produced during use of TCP under alkaline conditions and in temperatures greater than 100 degrees centigrade, which is distinct from the acid process employed at Givaudan (see Tab No. 32). These documents provide an independent technical basis for the conclusion that the Givaudan G-11 manufacturing process would not have generated TCDD.

An independent investigation of TCP and TCDD was conducted by the National Institute for Occupational Safety and Health ("NIOSH"), led by Dr. Fingerhut. In 1983, Dr. Fingerhut studied and researched the potential threat to workers at plants that produced and/or handled TCP and related chemicals known to be associated with TCDD. The results of her work were published for each facility studied, including an evaluation of the former Givaudan Site. One of Dr. Fingerhut's key findings was that the Givaudan Site had the lowest range of TCDD in its TCP and G-11, whereas the highest concentration of TCDD was found in plants where Agent Orange was produced, such as the Diamond Alkali site in Newark, New Jersey (*see* Tab No.'s 23, 46, and 47).

Documents provided to USEPA in 1983 summarize available information on Givaudan's 1948/1949-era pilot production of TCP and the management of waste generated from that process. Those documents indicate that the TCP produced by Givaudan, and used to manufacture G-11, was purified and therefore had lower TCDD content. Based on information gathered by Givaudan in 1983, the TCP waste products were drummed for disposal and picked up by waste haulers (*see* Tab No.'s 2 and 3). A 1967 memo states that Givaudan provided its TCP production and purification process to Hooker Chemical in return for Hooker agreeing to be the primary supplier of TCP to Givaudan (*see* Tab No. 52). This agreement gave Givaudan confidence that the Clifton Site would be supplied with high quality TCP, with low TCDD content, for use in producing G-11. Historical testing of Hooker Chemical TCP process waste streams demonstrated that the TCDD generated from the production of TCP was captured in the still residue and crude charged to the still material, which purified the TCP to reduce impurities, including TCDD content (*see* Tab No.'s 10 and 11).

In August 1976, USEPA visited the former Givaudan Site and obtained three samples from the TCP material on hand for testing (*see* Tab No. 28). USEPA's testing confirmed the TCP results that Givaudan shared for the same material, which was in the low part per billion range for TCDD (*see* Tab No. 29).

In 1977, Givaudan met and contracted with Dow as a TCP supplier, requiring Dow to meet Givaudan's specifications for TCP to manufacture its G-11 (*see* Tab No.'s 30, 31, and 32). These documents support Givaudan's consistent approach to quality control for the TCP raw material used to make G-11, which required a purified form of TCP with low impurities. In 1978, Dow TCP drums were tested and confirmed TCDD concentrations at less than 0.01ppm (*see* Tab No. 33).

A 1983 Givaudan memo states that the production of up to 2,200 pounds of G-11 was lost during the State-imposed temporary shutdown of the G-11 operation pending the results of the TCDD investigation (*see* Tab No. 40). At that time, Givaudan performed additional testing of TCP to confirm that each lot of TCP had low levels of TCDD so that it could be used when G-11 production was allowed to resume. Testing confirmed that the TCP lots contained less than 1 part per billion of TCDD. Documentation also confirms that buildings 58, 59, and 60 were cleaned and that all waste material from this work was stored in building 54 (*see* Tab No. 42). Also provided is additional documentation related to the duties of the G-11 operators, which details each step of the manufacturing process and documents how waste residues were reclaimed for reuse in the process, collected in containers for disposal, and acid waste and process water was sent to the sewer (*see* Tab No.'s 44 and 45). In addition, the G-11 process had a catch-all tank that caught solids and residues before discharging waste water to the sewer.

In its prior 104(e) responses, Givaudan provided results of TCP and G-11 testing available at that time. Routine testing of G-11 for TCDD was in place by at least 1978 (*see* Tab No. 39). Included with this submittal is additional testing data to show that Givaudan maintained tight quality control on specifications for both the TCP raw materials and G-11 product in their manufacturing process (*see* Tab No.'s 6, 7, 8, 9 and 10). Givaudan imposed similar quality control on its raw material suppliers when evaluating options for purchasing TCP (*see* Tab No. 17). Testing of G-11 was also completed in 1983 by the Food and Drug Administration (FDA) to document the quality of the material. After these tests, the FDA took no further action with respect to Givaudan's G-11 product (*see* Tab No. 43).

GIVAUDAN'S WASTE MANAGEMENT PRACTICES PREVENTED OFFSITE MIGRATION OF CONTAMINATION

In prior 104(e) responses, Givaudan provided summary tables of the quantity and disposal locations for waste generated during the remediation. Attached documentation demonstrates that any TCDD-impacted soil identified at the Clifton Site was excavated, placed in drums and stored inside secured areas protected from the weather pending decisions on final handling of this material (*see* Tab No. 4). In addition, Givaudan has located copies of receipts and waste manifest forms obtained from archived files that provide supporting documentation concerning TCP and G-11 waste drums disposed between 1978 and 1983 (*see* Tab No.'s 13, 14 and 16). Separate documentation was found for the removal and disposal of PCB oils and G-11 filter cake in 1982 (*see* Tab No. 15). In prior 104(e) responses, Givaudan provided information that waste solvents were used as a fuel supplement for the plant boilers. Additional supporting documentation is provided herein (*see* Tab No.'s 20 and 21).

TCDD-IMPACTED SOIL REMEDIATION

In its prior submissions, Givaudan provided USEPA with the results of the 1980s TCDD soil investigation, including the reports and maps prepared as part of the remedial work completed under the Administrative Consent Order (ACO) that Givaudan entered into with the State of New Jersey. Included with this submittal are additional communications with the NJDEP related to the investigation and remediation work, which document various approvals and agreements between the parties (*see* Tab No.'s 18, 19 and 22). As noted in the March 5, 1987 Administrative Consent Order for TCDD, results of the investigation conducted by Givaudan under the supervision of NJDEP, in conjunction with investigations by USEPA and the Department of Health, confirmed that there was "no evidence that TCDD contamination has migrated off the Site." (*See* Tab No. 24, at ¶32).

USEPA PASSAIC RIVER SOURCE INVESTIGATION

In August 2015, USEPA conducted soil sampling within the containment cell at the Clifton Site. Lockheed Martin (LM) and Scientific Engineering, Response and Analytical Services (SERAS) conducted this work and AMO Environmental Decisions was retained as the Licensed Site Remediation Professional ("LSRP"). The "Waste Cell Repair Report" provided by USEPA's LSRP noted that the asphalt cap was thicker than expected. In addition, field change forms prepared by SERAS noted that the material to be sampled was at a much greater depth than expected. Ultimately, USEPA's sampling confirmed that concentrations of TCDD within the cell at the Clifton Site were all below 10 ppb (*see* Tab No. 53). The materials that USEPA sampled in the cell are the soils around the plant that were sampled and remediated under NJDEP oversight, which resulted in the issuance of an approved No Further Action letter in 2002. USEPA's investigation confirmed that only low levels of TCDD were identified and properly remediated at the Clifton Site.

CONCLUSION

Givaudan has provided documentation that the G-11 process wastewater was handled onsite at the plant until 1951-52 (at the latest), before it was discharged to PVSC via the Clifton City sewer system. After Givaudan acquired land that abutted River Road as part of the plant expansion in 1939, the facility connected to the River Road sewer, which was required by local ordinance. The facility's sewer connection at Delawanna Avenue could have been made as early as 1927, as the City sewer maps indicate that the Delawanna Avenue line was installed in 1927, and later sewer maps show that a connection at the location of the former Givaudan plant was in place.

A review of City of Clifton ordinances, meeting notes, aerial photography, topography, and sewer maps confirms that Givaudan did not discharge its wastewater to Yantacaw Pond, the Third River, or the Passaic River. Further, there was no overland drainage ditch or pathway from the Clifton Site to the Passaic River. Multiple lines of evidence support the fact that the lowest point of elevation on the Givaudan Site was to the south at River Road adjacent to the rail line, and that elevations were higher to the north along Delawanna Avenue and to the east where the residential neighborhood is located, such that no surface water runoff could flow off the plant property other than the low point at River Road and the rail line.

Finally, historical documents and sampling data confirms that the TCDD level in the TCP used to make G-11, and the G-11 product itself, was carefully monitored to follow strict quality control guidelines. This conclusion is also supported by third parties that independently reviewed Givaudan's G-11 manufacturing process. These conclusions are confirmed by the historical documents and recent USEPA sampling data from its investigation of the Clifton cell in 2015.

CERTIFICATION OF SUPPLEMENTAL RESPONSE
TO REQUEST FOR INFORMATION

State of New Jersey

County of Morris

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document (Supplemental Response to EPA Request for Information), and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete, and that all documents submitted herewith are complete and authentic unless otherwise indicated. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment. I am also aware that my company is under a continuing obligation to supplement its response to EPA's Request for Information if any additional information relevant to the matters addressed in EPA's Request for Information or the company's response thereto should become known or available to the company.

John Trombley
Givaudan Fragrances Corp.
Head of Consumer Products

SIGNATURE

Sworn to before me this 2nd day of November, 2016

Notary Public Signature

MEGHAN EVANS BEREZA
Notary Public
State of New Jersey
My Commission Expires Jul 19, 2017

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TAB	DOCUMENT	DESCRIPTION	SUPPLEMENTS RESPONSE #
1	Aerial Photos dated 1931 - 2012	Additional aerial photos and topography depicting conditions and features at the former Givaudan facility in Clifton, New Jersey, as well as conditions and features in the area surrounding the site, including Yantacaw Lake and the Third River.	USEPA Supplemental Request for Information dated September 2009, Question No. 4.
2	Letter from J. Rankin (Givaudan) to R. Basso (USEPA) dated October 26, 1983	Detailed response to questions related to information regarding the manufacturing or processing of 2,4,5-TCP, documenting that Givaudan manufactured 2,4,5,-TCP and distilled it into pre purified 2,4,5-TCP in 1948 and 1949, and thereafter only purchased and used pre-purified 2,4,5-TCP to manufacture hexachlorophene. An estimate of light fractions and still bottom wastes from the purification step of 2,4,5-TCP is presented, and that it is believed these wastes were drummed; however, waste disposal records from that time no longer exist.	USEPA Request for Information dated May 2004, Question No. 4.
3	Rider to Letter Dated October 26, 1983 from Givaudan Corp to Mr. Raymond Basso	Confidential – Proprietary Trade Secret Information provides details on certain product manufacturing using two pieces of equipment believed to have been used in the production of 2,4,5-TCP during the 1948 to 1949 time period.	USEPA Request for Information dated May 2004, Question No. 4.
4	Letter from T. Quigley (NJDEP) to L.Levy (Givaudan) dated March 20, 1995	Documents approval to relocate 128 drums of excavated material from the contaminated non-process area for storage into two secured metal shipping containers. Documents control and amount of contaminated non process area excavated material.	USEPA Request for Information dated May 2004, Question No. 5.
5	Letter from B. McCullough (Occidental) to Mr. Blecker (Givaudan) dated March 12, 1971	Results from testing 2,4,5 TCP and Hexachlorophene samples from Givaudan for 2,3,7,8 TCDD; all results reported as <0.10 ppm to <1.0 ppm. Documents quality of pre purified 2,4,5 TCP supplied to Givaudan by Occidental (Hooker). Documents testing of material and quality	USEPA Request for Information dated May 2004, Question No.4.

		control of 2,3,7,8 TCDD content in TCP in early 1970s	
6	Hooker Chemical Memo from R. Vattimo (Chemist) to L. Tufts (Mgr of QA) dated October 27, 1970	Results from testing 2,4,5 TCP and G-11 (Hexachlorophene) samples from Givaudan for Dioxin; all results reported as <0.5 ppm, except one sample of G-11 reported at <.1ppm. Documents quality of pre purified 2,4,5 TCP supplied to Givaudan by Occidental (Hooker). Documents testing of material and quality control of 2,3,7,8 TCDD content in G-11 as of at least 1970	USEPA Request for Information dated May 2004, Question No. 4.
7	Hooker Chemical Memo from G. Hahn (Chemist) to L. Tufts (Mgr of QA) dated July 24, 1970	Results from testing samples of G-11 from Givaudan for 2,3,7,8 TCDD. No "Dioxin" was detected. Documents quality of G-11 product made from pre purified 2,4,5 TCP. Documents testing of material and quality control of 2,3,7,8 TCDD content in G-11 as of at least 1970	USEPA Request for Information dated May 2004, Question No. 4.
8	Hooker Chemical Memo from G. Hahn (Chemist) to L. Tufts (Mgr of QA) dated July 7, 1970	Results from analyzing samples of G-11 from Givaudan for 2,3,7,8 TCDD reporting no trace 2,3,7,8 TCDD found. Results reported in the range of <0.01 ppm to <0.02 ppm. Documents quality of G-11 product made from pre purified 2,4,5 TCP. Documents testing of material and quality control of 2,3,7,8 TCDD content in G-11 as of at least 1970	USEPA Request for Information dated May 2004, Question No. 4.
9	Hooker Chemical Memo from G. Hahn (Chemist) to L. Tufts (Mgr of QA) dated June 8, 1970	Results from analyzing samples of G-11 from Givaudan for 2,3,7,8 TCDD reporting no trace of 2,3,7,8 TCDD. Results reported in the range of <0.01 ppm to < 0.03 ppm. Documents quality of G-11 product made from pre purified 2,4,5 TCP. Documents testing of material and quality control of 2,3,7,8 TCDD content in G-11 as of at least 1970	USEPA Request for Information dated May 2004, Question No. 4.
10	Hooker Chemical Memo from G. Hahn (Chemist) to L. Tufts (Mgr of QA) dated March 30, 1970	Presents results of testing the waste streams from the Hooker Trichlorophenol (TCP) process for 2,3,7,8 TCDD and documents that most of the 2,3,7,8 TCDD is in the TCP is captured in the Still Residue and Crude Charged to Still. Documents that the Hooker process produces 2,4,5	USEPA Request for Information dated May 2004, Question No. 4.

		TCP with non-detectable to low levels of 2,3,7,8 TCDD. Documents testing of material and quality control of 2,3,7,8 TCDD content in TCP as of at least 1970	
11	Hooker Chemical Memo from G. Hahn (Chemist) to L. Tufts (Mgr QA) dated March 9, 1970	Presents results of testing Flake Trichlorophenol for 2,3,7,8 TCDD reporting no TCDD was found. Reporting limits at 0.2 ppm, but may have been 1.0 ppm. Documents quality of Trichlorophenol made by Hooker. Documents testing of material and quality control of 2,3,7,8 TCDD content in TCP as of at least 1970	USEPA Request for Information dated May 2004, Question No. 4.
12	Exhibit VI (Occidental Document production OCC00993564; NJ NB production OCCNJ0107937)	Hooker Chemical Process Description 2,4,5 Trichlorophenol (TCP) Production	Provided for informational purposes: Hooker was sole supplier of purified TCP to Givaudan from 1949 to 1971.
13	Receipts, manifest forms, and listing of waste disposed during 1983	Documents quantity of 2,4,5 TCP, G-11 (Hexachlorophene) still bottoms and off specification material, and other wastes stored in drums removed from the Clifton site. Documents that these waste streams were stored in drums on site and were properly removed.	Supplemental response to EPA request for information dated May 2004, Question No. 5 and 11.
14	Letter from G. Martini (Sales Mgr CECOS Intl, Inc.) to J. Angiolini (Givaudan) dated December 20, 1982	Communication confirming acceptance by CECOS to collect and dispose of Hexachlorophene and low flash organic liquids). Documents proper management of waste streams.	Supplemental response to EPA request for information dated May 2004, Question No.5 and 11.
15	Letter from E. Boccuzzi (Sales Representative CECOS Intl, Inc.) to C. Lord (Givaudan) dated August	Documents removal of PCB oils and solid non-hazardous still bottom residue and boiler ash. Residue includes hexachlorophene filter cake. Documents proper	Supplemental response to EPA request for

	25, 1982	management of waste streams.	information dated May 2004, Question No. 5 and 11.
16	Handwritten list of waste disposal from Givaudan file, undated and not signed	List identifies numerous drums of Hexachlorophene filter cake were sent for disposal to Newco Chemical Waste Systems on the following dates; 1) December 8, 1978, 2) January 16, 1979, and 3) March 6, 1979. Documents proper disposal of waste streams.	Supplemental response to EPA request for information dated May 2004, Question No. 5 and 11.
17	Letter from H. Brandaman (Givaudan) to Dr. P. Oberhansli (Givaudan Switzerland) dated March 9, 1978	Communication regarding testing of Celamark TCP used to make G-11 as part of an evaluation on using TCP from Celamark. Letter (note 3) documents current TCDD specification for the DOW TCP pure is <10 ppb and testing of material is consistently < 1 ppb. Identifies that Celamark would have to meet TCP standard of < 5 ppb TCDD. Documents Givaudan's quality control on TCP used to produce G-11.	USEPA Request for Information dated May 2004, Question No. 4.
18	Letter from J. Karpa (NJDEP) to L. Levy (Givaudan) dated April 4, 1988	State approves removal work completed in vicinity of soil sample #G-11 and documents the boundary of the contaminated process area can be modified as shown on Drawing A9565, Rev. 2.	USEPA Request for Information dated May 2004, Question No. 12.
19	Letter from L. Levy (Givaudan) to J. Karpa (NJDEP) dated April 4, 1988	Letter summarizes soil removal from area around sample #G-11. Excavated soil was stored in 128 drums that were temporarily stored in the contaminated non-process area. Documentation of removal work and temporary storage of soil in drums, pending final remedial action approval.	USEPA Request for Information dated May 2004, Question No. 5.
20	Givaudan memo (G. Talarico) dated January 17, 1984	Summarizes use of alternate fuel used in plant boilers.	USEPA Request for Information dated May 2004, Question 4 iii.

21	Letter from Givaudan (J. Angiolini) to NJDEP (Mr. Micai) dated March 27, 1984	Provides additional information regarding use of alternate fuels for Boilers 4 and 5.	USEPA Request for Information dated May 2004, Question 4 iii.
22	Letter from NJDEP (Mr. Catania) to Pitney Hardin Kipp & Szuch (W. Hyatt) dated July 12, 1983	Documents NJDEP approval to move (sell) Hexachlorophene (HCP) as test results for the product showed < 0.1 ppb for 2,3,7,8 TCDD. Information supports low concentration of 2,3,7,8 TCDD in finished HCP and that product was also stored in buildings.	USEPA Request for Information dated May 2004, Question No. 5.
23	Letter from Givaudan (M. Manowitz) to NIOSH (D. Marlow) dated August 17, 1984	Provides response to request from Dr. Fingerhut's February 8, 1984 letter including; 1) description of Hexachlorophene (HCP) manufacturing process, 2) description of 2,4,5 TCP manufactured process, 3) Volume of HCP produced annually from 1947 to 1984, and 4) HCP operator duties. Confirms HCP production used low temperatures, was an acidic process, and used a purified 2,4,5 TCP as feedstock, which did not create 2,3,7,8-TCDD.	USEPA Request for Information dated May 2004, Question No. 4.
24	In the Matter of Givaudan Corporation - Administrative Consent Order – TCDD (dated March 5, 1987	Investigation conducted by Givaudan under the supervision of NJDEP, and investigations by EPA and the Department of Health, confirmed that there was no evidence that any TCDD contamination had migrated off of the Site.	USEPA Request for Information dated May 2004, Question No. 12.
25	Series of City of Clifton resolutions - dated 1915, 1916 and 1917	These City of Clifton resolutions confirm that sewer construction began prior to the 1920s, before Givaudan owned or operated the Clifton Site.	General information responsive to numerous questions from USEPA.
26	DIOXINS – EPA-600, 2-80-197, November 1980 by M.P.Esposito,	Report discusses the sources for, and the chemical processes that generate, dioxin. Pages 106 through 108	USEPA Request for Information dated

	T.O. Tiernan and Forrest E. Dryden for David R. Watkins – Industrial Pollution Control Division – Industrial Environmental Research Laboratory- Cincinnati, Ohio 45268	describe the process to produce Hexachlorophene, also known commercially as G-11, and the common uses for the product. References the World Health Organization as reporting in 1977 the grade of Hexachlorophene produced today is reported to contain less than 15ug/kg (<15 ppb) 2,3,7,8 TCDD. Discusses four known process patents for the production of Hexachlorophene. Indicates that "There is no indication that dioxins would be formed during the production of hexachlorophene, since highly acidic conditions are maintained throughout the process and temperatures are well below those known to be needed for dioxin reactions (Kimbrough 1974)." Further states that if dioxins are found the most likely explanation for their presence is from the 2,4,5,-TCP raw material used in the process. References Givaudan as being the only known active producer of Hexachlorophene in the United States and in 1976 independent testing by Wright State University found 1.8 ppb and 1.9 ppb of TCDD in two representative samples of 2,4,5-TCP (Tiernan 1976). Givaudan specifies a extremely low dioxin content from its supplier, presently DOW Chemical. "In 1978, five waste samples from the Clifton plant were analyzed for chlorinated dioxins. None were found at a 0.1 ppm level of detection (U.S. Environmental Protection Agency 1978). Subsequent analysis of three of these samples found no TCDD's at 0.1 or less ppb."	May 2004, Question No. 4.
27	Letter from A. Arcenal (NJDEP) to W. Turetsky (Givaudan) dated February 16, 1983	Transmittal letter attaching the drillers' well logs for Givaudan's Well No's. 6 and 7; log for Well No. 6 includes note that "There are five wells at this plant. All are abandoned because of pollution by aromatic chemical waste. The waste is dumped into pits adjacent to the plant." Note is dated 6-15-49 and supports understanding that process waste water was handled in onsite basins as	USEPA Request for Information dated May 2004, Question No. 5.

		shown in aerial photos at Tab No. 1.	
28	Internal EPA Region II Memo by R. Turpin and Dr. A. Gevirtz dated August 20, 1976; copies to N. Greif and J. Dorsky	Summarizes visit by EPA officers on August 20, 1976 related to their review of use of Trichlorophenol. Plant visited after Icmesa incident to check on any recent TCP shipments to Clifton. US Custom forms attached noting that the TCP at Clifton from Icmesa was exported prior to the accident and samples were provided to EPA from three lots of material on hand.	USEPA Request for Information dated May 2004, Question No. 4.
29	Letter from USEPA Region II (M. Polito) to Givaudan (F. Eichel) dated November 22, 1976	Transmits memo with results of testing samples of TCP obtained during the August 20, 1976 EPA Region II site visit. Results reported as consistent with other TCP testing by Givaudan. Results by both parties (Wright State and Givaudan) for two sample lots reported in the 1.8 ppb to 2.0 ppb range. One lot reported by NIEHS at 0 to 2 ppb sensitivity; Givaudan reported result of 14.0 ppb.	USEPA Request for Information dated May 2004, Question No. 4.
30	Internal Givaudan Memo dated February 16, 1977	Documents meeting with DOW at Clifton on Feb. 16, 1977 to review Specifications for 2,4,5-TCP. DOW proposed and Givaudan requested a TCDD specification of < 0.01 ppm.	USEPA Request for Information dated May 2004, Question No. 4.
31	Internal Givaudan Memo dated December 1, 1983	Givaudan Corporation Quality Control Department Specifications for 2,4,5-Trichlorophenol. Specifies maximum TCDD at 1 ppb and that certification for TCDD content be furnished by the supplier of each batch of TCP.	USEPA Request for Information dated May 2004, Question No. 4.
32	Internal DOW Agricultural Products Department technical data sheet for Product Stewardship Guidelines for Safe Handling of 2,4,5-Trichlorophenol Purified (not dated)	Identifies specification for TCDD to be 0.01 ppm maximum. Describes physical, toxicological and properties of product. Describes safe handling procedures and precautions. Documents conditions that would result in TCDD formation including long storage period of molten product in excess of 80 degrees centigrade, processing temperatures in excess of 150 degrees centigrade and operations where TCP is handled in alkaline conditions over 100 degrees centigrade. Based on	USEPA Request for Information dated May 2004, Question No. 4.

		available documentation, none of these conditions were part of the production of Hexachlorophene at the Clifton facility.	
33	Letter from J. Ulrich (DOW) to R. Aron (Givaudan) dated February 6, 1980	Reports 1978 testing of drums of TCP from lot number MM06139 and lot number MM07248, both had TCDD content as < 0.01 ppm.	USEPA Request for Information dated May 2004, Question No. 4.
34	2,4,5-Trichlorophenol Specifications	Provides specifications for TCP in 1978 and attaches DOW's certificated f analyses for both technical grade and purified TCP.	USEPA Request for Information dated May 2004, Question No. 4.
35	Letter from PVSC to City of Clifton Engineer – dated July 6, 1977	Discussed 1979 pipe leak below the River Road bridge, attaches 1946 and 1953 communication regarding responsibility for maintenance. Further confirmation that Givaudan was likely connected to the River Road sewer as early as 1946, but no later than 1953.	USEPA Request for Information dated May 2004, Question No. 8.
36	Sanborn Maps for 1935, 1951, 1952, 1965, 1970 and 1984	Maps document property bordered to the west by the railroad and to the north by Delawanna Avenue. Maps show expansion of the plant over time, which is also shown in aerial photos under Tab No. 1.	USEPA Request for Information dated May 2004, Question No. 1 and 13.
37	Title No. 98-LT-0846 (Stewart Title) dated December 15, 1998 and undated zoning map with hand written numbers	Title records document original land purchase of Parcel 1 by Burton T. Bush, Inc. by Deed from Antoine Chiris Company dated August 14, 1924, and lists subsequent purchases made to expand the plant property; lot numbers on undated zoning map correspond to Title summary.	USEPA Request for Information dated May 2004, Question No. 1 and 13.
38	Letter from H. Daeniker (Givaudan) to Director of Bureau of Drugs (FDA) dated August 18, 1970	Transmits two papers; 1) Photodegradation of Hexachlorophene, and 2) Investigations concerning the possible presence of 2,3,7,8 – Tetrachlorodibenzo-p-dioxin in Givaudan's Commercial Hexachlorophene.	USEPA Request for Information dated May 2004, Question No. 4.
39	Givaudan Inter-Office Memo from L. Levy to J. Rankin dated June 22, 1983 – TCDD Analysis in	Documents routine analysis of G-11 and low levels of TCDD in product, summarizes testing procedure and policy of the Quality Control Department: "that if any	USEPA Request for Information dated May 2004,

	Hexachlorophene	analysis was above 1 ppb on the composite sample, each lot would be analyzed individually." Further states that prior to June 1978 the majority of samples analyzed were less than 1.0 ppb, with several samples (3 to 4) being below 4.0 ppb. Higher levels attributed to interference in the testing equipment. All samples after June 1978 were found to contain less than 1.0 ppb.	Question No. 4.
40	Givaudan Memo (D. Soltis) dated June 22, 1983 – Production Affected by Restrictions	Summarizes impact on production capacity for certain products due to the State imposed temporary, partial shutdown of production. Identifies products manufactured and quantities in affected buildings and identifies daily rate of G-11 production as 2,200 pounds daily. Total lost production from all impacted buildings as 35,300 pounds daily, or approximately 43% of total average daily production.	USEPA Request for Information dated May 2004, Question No. 4.
41	Letter from NJDEP (Catania) to Pitney Harding Kipp & Szuch (W. Hyatt) dated July 12, 1983	Documents NJDEP approval for moving G-11	USEPA Request for Information dated May 2004, Question No. 4.
42	Letter from Pitney Hardin Kipp and Szuch (W. Hyatt) to NJDEP (Catania) dated July 26, 1983	Transmits affidavit of L. Levy (Givaudan) dated July 22, 1983, which describes TCDD results of inventory of trichlorophenol. Proposed using trichlorophenol from specific lots to recommence Hexachlorophene production. These TCP lots showed less than 1 part per billion of TCDD. Letter also documents cleaning of buildings 58, 59 and 60, with all wastes generated being stored in Building 54.	USEPA Request for Information dated May 2004, Question No. 4.
43	Letter from Department of Health and Human Services (L. Fantasia) to Givaudan (Dr. Manowitz) dated July 29, 1983	Documents that all samples of company's Hexachlorophene analyzed by the Food and Drug Administration for dioxin met the USP specification. The Food and Drug Administration confirmed no further action regarding the Hexachlorophene stored at the plant.	USEPA Request for Information dated May 2004, Question No. 4.

44	Undated, hand written notes from Givaudan files – G-11 Operator Duties	Detailed summary of each step in the production of G-11 and the duties of each operator in the production process. Provides documentation on management of material from each step in the process as being reused, sent to sewer, or packaged for disposal.	USEPA Request for Information dated May 2004, Question No. 4 and 5.
45	Hexachlorophene Process Flow Diagram (Confidential)	Shows G-11 production process, with spent filter cake being containerized for disposal, and catch-all tank in system prior to sewer discharge at end of process.	USEPA Request for Information dated May 2004, Question No. 4.and 5.
46	Letter from Givaudan to NIOSH (Dr. Fingerhut) dated July 1, 1983	Lists references sent to Dr. Fingerhut by Givaudan	USEPA Request for Information dated May 2004, Question No. 4.
47	A Retrospective Job Exposure Matrix for Estimating Exposure to 2,3,7,8 Tetrachlorodibenzo-p-dioxin – NIOSH March 1999	Discusses results of research on worker exposure at eight US plants producing or using 2,4,5 – trichlorophenol and its derivatives between 1942 and 1984. Plants are only identified by number. Givaudan was provided a separate report for its Clifton plant, identified as Plant 11. Givaudan (Plant No. 11) had the lowest reported range of TCDD concentration in both TCP and HCP compared to other plants (Table II Bulk Sampling Data-page 18). The plants associated with Agent Orange manufacturing had the highest reported TCDD concentrations in their tested material. The attached report for Plant No. 11 (Clifton Plant) indicates that during the couple of years Givaudan manufactured its own trichlorophenol, it used a distillation step to remove impurities (page 2), and after 1949 Givaudan used TCP from Plant 10 (page 3) with a TCDD content of 0.01 micrograms per gram.	USEPA Request for Information dated May 2004, Question No. 4 and 5.

		The NIOSH reports document low levels of TCDD in both the trichlorophenol feed stock and the hexachlorophene product made at Clifton by Givaudan.	
48	Givaudan Memo – "Recovery of G-11 from Sediment in Sewer Ditch" – dated August 27, 1951	Discusses the recovery of G-11 product from the on-site pond in 1951, which was part of the "old sewer system" at the Clifton Plant. (*See* Aerial Photos at Tab No. 1).	USEPA Request for Information dated May 2004, Question No. 5 and 6c.
49	May 12, 1978 letter from Celamerck to Givaudan	Provides analytical results of 2,4,5 TCP testing from various drums all reported with less than 1 ppb TCDD.	USEPA Request for Information dated May 2004, Question No. 4.
50	Givaudan Memo by G. Talarico – Plant Storm Water – dated December 30, 1981	Documents runoff during high precipitation events accumulated in low area adjacent to River Road and the rail road tracks at the Clifton Plant.	USEPA Request for Information dated May 2004, Question No. 6c.
51	City of Clifton Planning Board – Master Map – Sanitary Sewer System – dated March 1945	Confirms that majority of the City of Clifton was connected to sanitary sewer by 1945.	USEPA Request for Information dated May 2004, Question No. 6d.
52	Internal Givaudan Correspondence regarding Hooker Chemical – dated May 30, 1967	States that Givaudan provided Hooker with its TCP manufacturing process information in exchange for Hooker agreeing to be the primary supplier of TCP to Givaudan.	USEPA Request for Information dated May 2004, Question No. 4.
53	Table showing results of EPA's 2015 sampling event at Givaudan's containment cell	Confirms that concentrations of dioxin in soil placed in Givaudan's containment cell are below 10 ppb.	USEPA Request for Information dated May 2004, Question No. 12.
54	Oversized Figure showing building designations at former Givaudan property	This figure was used as a reference in identifying building numbers on the Aerial Photograph Exhibits.	USEPA Request for Information dated May 2004, Question No. 3.

TABLE OF CONTENTS

*Denotes aerial images that have been printed and reviewed under stereoscope. Stereoscope prints were supplied by Aerial Archives.

General Notes:

1. The site boundary depicted in red on each aerial photo includes only the parcels owned by Givaudan (or its predecessors) at the time the photo was taken. Exhibit 2 presents the chronology of parcel purchase at the facility.
2. Each aerial photo contains a bar scale indicating the relationship between measured length on the aerial photo and the distance on the earth surface, and a representative fraction scale, which indicates how one unit on the aerial photo relates to the same units on the earth surface (e.g., 1:2,400 indicates 1 inch on aerial photo is equal to 2,400 inches on the earth surface).

BUILDING NUMBERS AND PERTINENT SITE FEATURES (1979 AERIAL)

Legend

Site Boundary

Feet

0 100 200 400

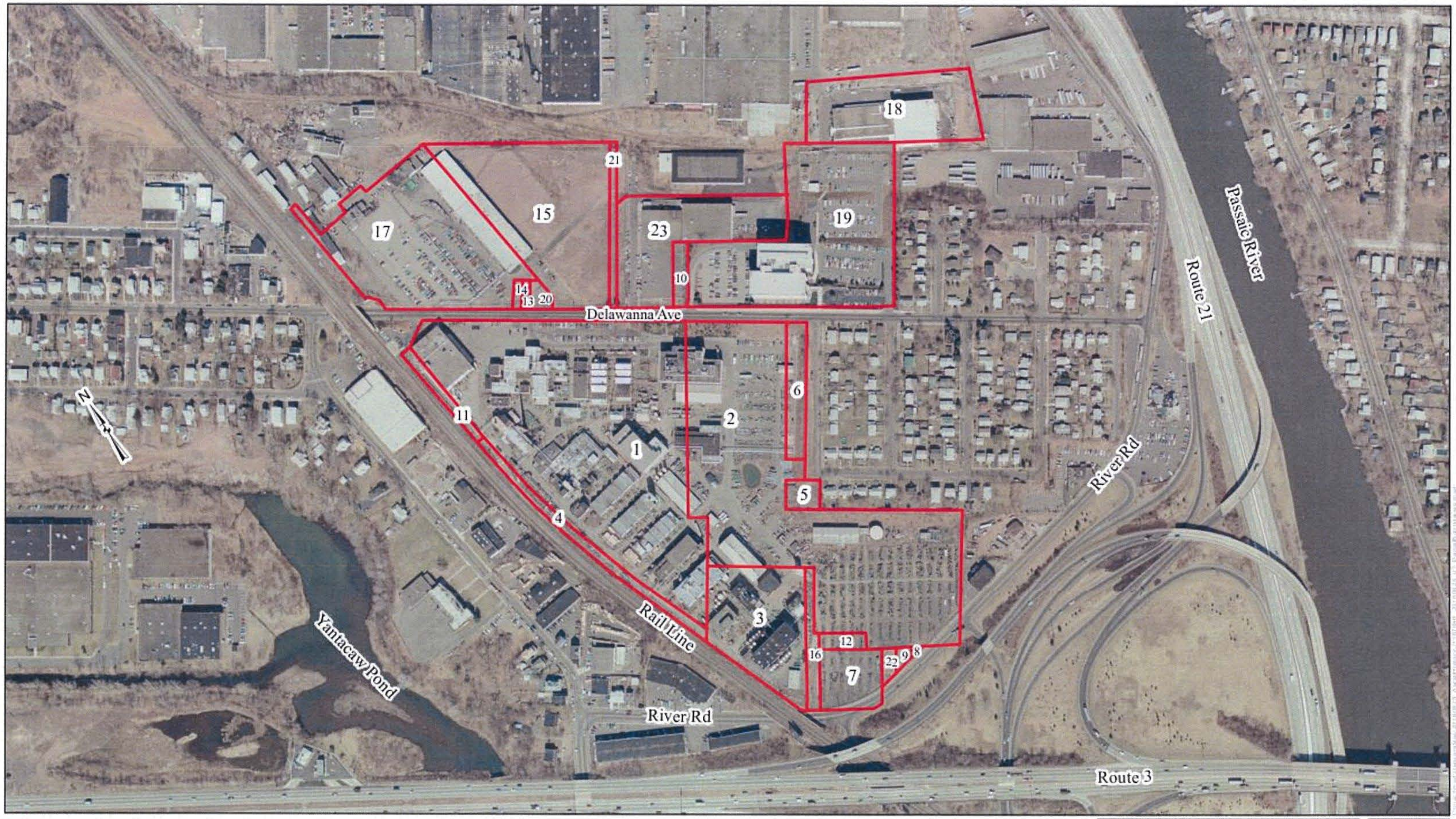
1:2,400

NOTES:
Parcel Boundaries are approximate.

Building number history gathered from The Givaudan Corporation site plan provided by Givaudan.

DATA SOURCES:
1979 Aerial: 790322-8-5964
Building Numbers as of 1972: Sanborn Library, LLC., 1935.
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

Pertinent Site Features	Exhibit
Givaudan - Passaic Clifton, NJ	1



— Givaudan Parcel Boundaries

Feet
0 100 200 400
1:3,600

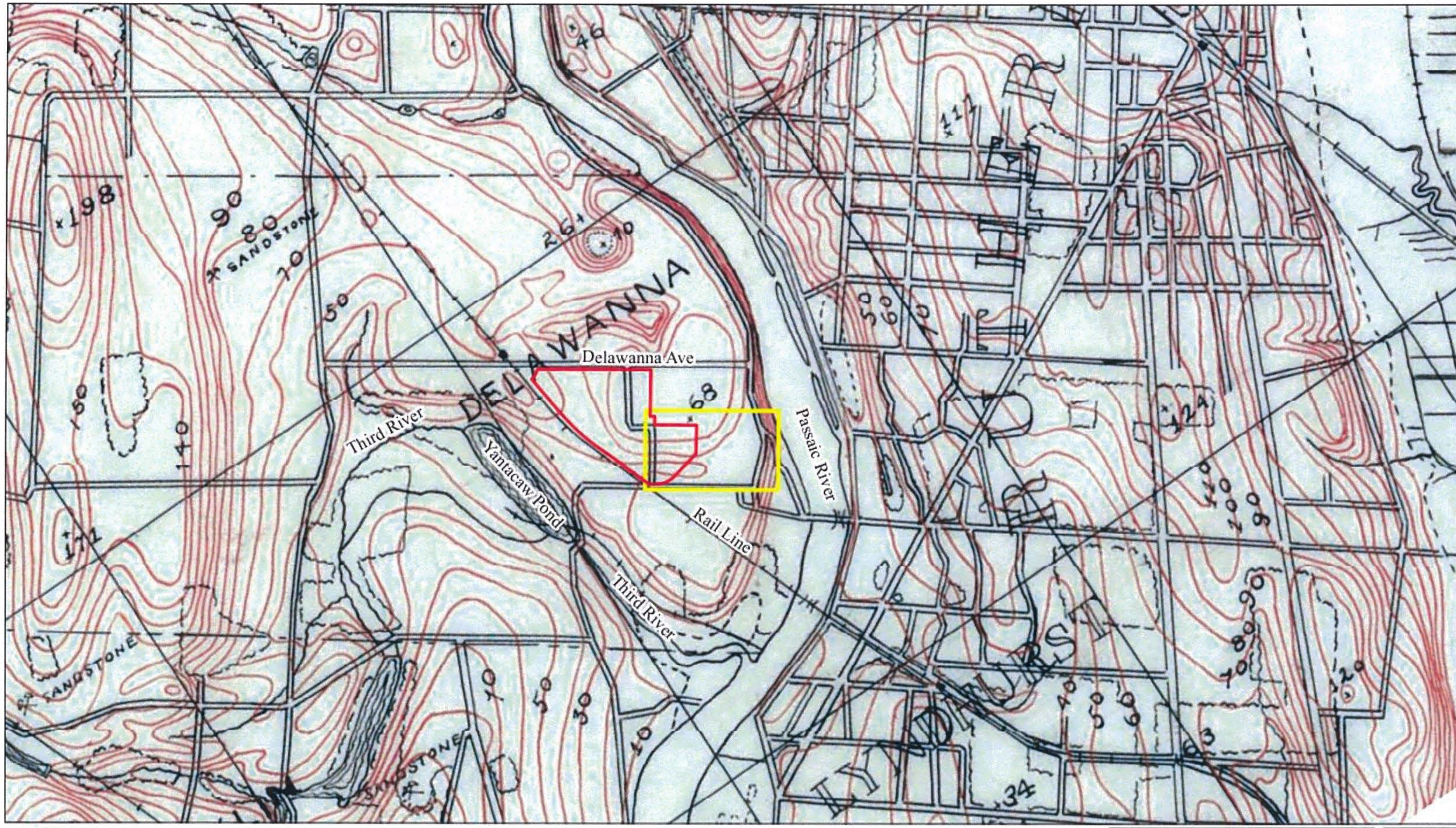
NOTES:
Parcel boundaries are approximate.

DATA SOURCES:
1979 Aerial: 790322-8-5964
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

Givaudan Parcel Acquisition	Exhibit
Givaudan - Passaic Clifton, NJ	2

Parcel Boundaries

- In 1924, Givaudan purchased the assets of Burton T. Bush, Inc.
- Burton T. Bush, Inc. purchased Parcel 1 of the property in 1924 and Parcel 2 in 1925; both from Antoine Chiris.
- Parcel 3 was acquired by Burton T. Bush, Inc., in 1939.
- Parcel 4 was acquired from the railroad by Burton T. Bush, Inc., in 1941.
- Parcels 5 and 6 were acquired by Burton T. Bush, Inc. from the City of Clifton in 1946.
- Parcel 7 was acquired from the City of Clifton by Burton T. Bush, Inc., in 1946.
- The remaining parcels were acquired under The Givaudan Corporation name.
- Parcel 8 was acquired from the State of New Jersey in 1960.
- Parcel 9 was acquired from Albert Rau in 1960.
- Parcel 10 was the first parcel acquired north of Delawanna Avenue, in 1967.
- Four additional parcels were acquired south of Delawanna Avenue, including:
  - Parcel 11 in 1968
  - Parcel 12 in 1968
  - Parcel 16 in 1968
  - Parcel 22 in 1978
- The remaining parcels were acquired north of Delawanna Avenue, and include:
  - Parcels 13, 14 and 15 in 1968.
  - Parcel 17 in 1969
  - Parcel 18 in 1971
  - Parcels 19 and 20 in 1972
  - Parcel 21 in 1977
  - Parcel 23 in 1982



Site Boundary

Area of Topographic Evaluation

N

NOTES:
Boundaries are approximate.

DATA SOURCES:
Topographic Map: NJDEP_1870_1887_Topo_1
1880-1887 Topographic Image from NJ Department of Environmental Protection, Division of Water Supply and Geoscience.
Historic Tropographic Manuscript Maps by C.C. Vermeule around 1870-1887.

0 400 800 1,600 Feet
1:12,343

1870-1887 Historic Topography	Exhibit
Givaudan - Passaic Clifton, NJ	3

1870-1887 Historic Topography

- This historic topographic map indicates natural topography of the area prior to development.
- Contours indicate a local topographic high consisting of a “plateau” in the area northeast of the facility, where the future Dyer Avenue and residential development were constructed.
- Natural topography across the site was downward from this local high, generally towards Yantacaw Pond.
- The lowest natural elevation within the future site boundary (in red) was in the southernmost corner, near the intersection of River Road and the railroad.
- The yellow outline indicates the area where photogrammetry work was completed to evaluate historical topography from 3 sets of stereographic images, including 1940, 1954 and 1961.
- This area is generally located between the southernmost portions of the facility and the Passaic River.
- Results of the photogrammetry evaluations are included with other imagery from the respective years.

Site Boundary

Feet
0 100 200 400
1:2,598

NOTES:
Parcel boundaries are approximate. Parcels 1 and 2 are represented in this boundary.

DATA SOURCES:
1931 Aerial: 55687_1931_HistoricAerials_1
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1931 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	4

1931 – Site View

Observed Photograph Features

- Note: Bold red line outlines the extent of property owned by Givaudan (fka Burton T. Bush, Inc.) at the time of the aerial photograph.
- Most of property extent appears undeveloped.
- Approximately 20 buildings are noted in the north-central portion of the site.
- Areas of land disturbance appear as light toned, concaved-shaped features in the eastern portions of the developed site, near the area of the future stormwater detention pond.
- Residential areas are located to the south and east of the site.
- No channelized flow or surface drainage features noted on site.
- Y-shaped path/road (unimproved) trending NW-SE and intersecting with residential roadways.
- Yantacaw Pond is prominent.
- Apparent commercial/industrial development to northeast, across Delawanna Avenue.

Site Development Notes

- According to a 1972 site plan, the on-site buildings in this photo were constructed as early as 1914 (Building 7 – a boiler building) and through 1930 (Factory Mutual Engineering Division [FMED], 1972), suggesting many of the buildings present in this photo were constructed prior to Givaudan purchase of the original parcels.
- The 1935 Sanborn Map indicates a railroad spur enters the site adjacent to the northernmost buildings.
- The 1935 Sanborn Map indicates the industrial factory to the north is an oil cloth manufacturer.
- An initial water supply well was drilled in 1917 and six additional wells were drilled through 1948 (ERM, 2000). The water supply wells on the property were drilled into bedrock (Johnson, 1945).
- Various waste management units (cesspools and drywells) reportedly on property for mixed waste disposal (L. Levy letter, January 1994).
- A series of drawings from 1927, titled "Sanitary Sewer Record Drawing" from the City of Clifton Bureau of Engineering, indicates city sanitary sewer lines were in place near the facility in 1927.

— Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-3 are represented in this figure

DATA SOURCES:
1940 Aerial: 400406-13-143
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.
Reservoir: Sanborn Library, LLC., 1935.

1940 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	5

1940 – Site View

Observed Photograph Features

- Site beginning to expand southward along the Delaware-Lackawanna Railroad.
- Increased outside storage observed south of newly constructed buildings.
- Areas of land disturbance are more visible in the southeastern portions of the site, near the area of the future stormwater detention pond.
- Residential areas east and south of the site.
- Y-shaped roadway present along eastern property boundary, extending to residential area.
- Area west of railroad developed and in use.
- No channelized flow or surface drainage features noted on site.
- Yantacaw Pond unchanged.

Site Development Notes

- The original grouping of buildings (5/6 through 39) were constructed prior to 1935 and are visible, although not discernible, on the 1930 aerial photo (see Exhibit 4) (The Sanborn Library, 1935).
- Buildings 42 through 47 on this aerial were constructed in 1939 for manufacture of flavors, chemicals and essential oils (FMED, 1972).
- Building 48 constructed circa 1940 in process area.
- According to the 1935 Sanborn map for the area, the square surface impoundment is a 150,000 gallon reservoir (The Sanborn Library, LLC, 1935).
- Topography across the site is sloping downward towards the western site border with the railroad. The highest elevation is to the east, near the residential area.
- Various waste management units (cesspools and drywells) reportedly on property for mixed waste disposal (L. Levy letter, January 1994).

— Site Boundary

Feet
0 250 500 1,000
1:6,000

NOTES:
Parcel boundaries are approximate. Parcels 1-3 are represented in this figure.

DATA SOURCES:
1940 Aerial: 400406-13-143
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1940 Aerial Imagery - Regional View	Exhibit
Givaudan - Passaic Clifton, NJ	6

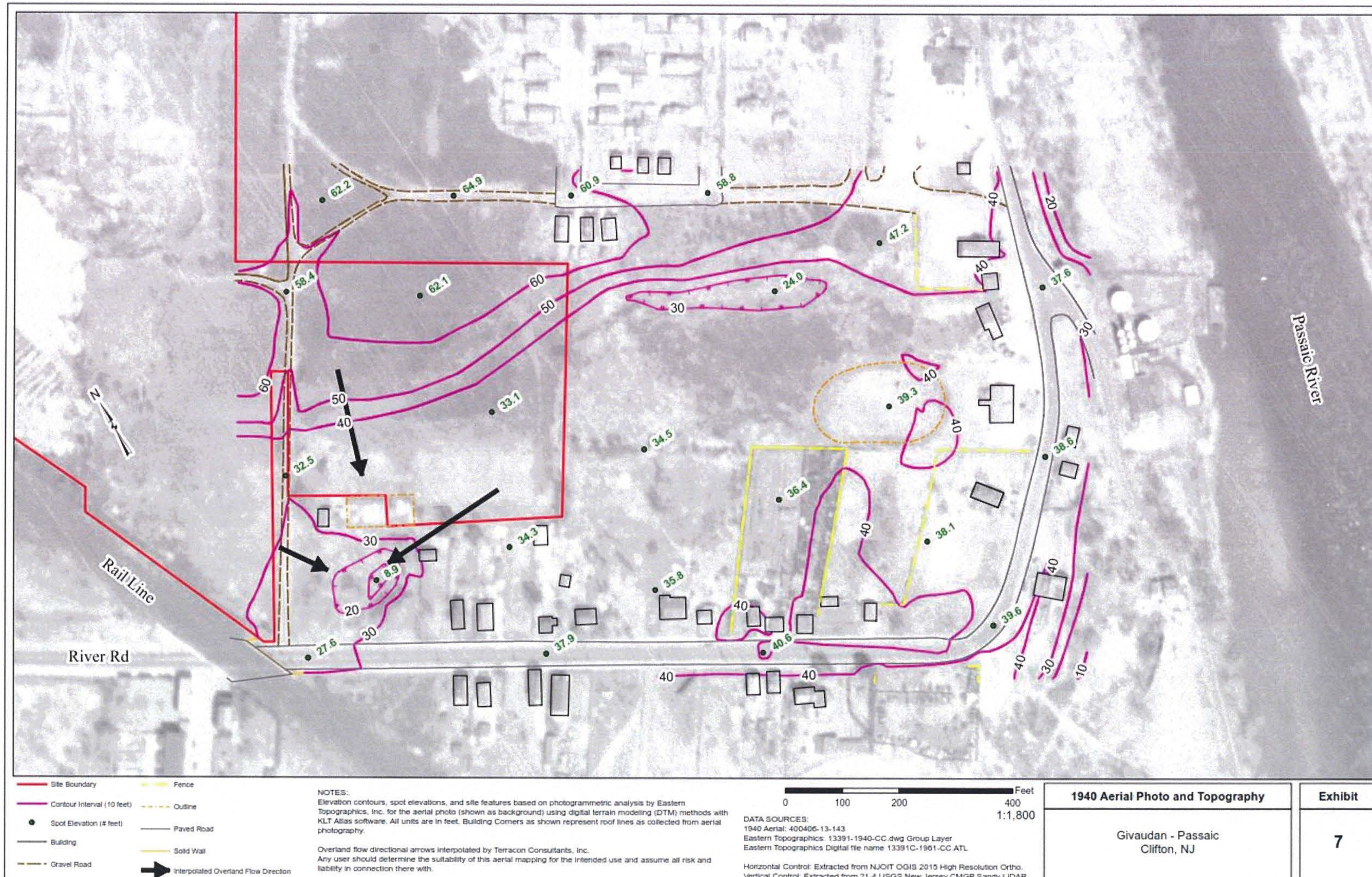
1940 – Regional View

Observed Photograph Features

- Large, undeveloped area northeast of site.
- Apparent surface water features to northeast.
- Apparent residential and commercial development between the site and the Passaic River.
- The Third River tributaries to Yantacaw Pond (upstream) include a natural flow that enters from the north and a likely man-made canal that flows into the southern end of the pond.
- Aboveground storage tanks observed between River Road and Passaic River.
- Large industrial facility north of site, across Delawanna Avenue.

Site Development Notes

- According to the 1935 Sanborn map for the area, the observed industrial facility north of Delawanna Avenue is operated as an oil cloth manufacturing facility by T.R. Goodlatte & Son, Inc. (The Sanborn Library, LLC, 1935).
- Krouse-Doremus Foundry Co. also operates north of Delawanna Avenue (Sanborn Library, LLC, 1935).
- Properties between the rail line and Yantacaw Pond include Abbey Coal Co., Alliance Lumber Corporation, and Minwax Waterproofing Company (Sanborn Library, LLC, 1935).



NOTES:
Elevation contours, spot elevations, and site features based on photogrammetric analysis by Eastern Topographics, Inc. for the aerial photo (shown as background) using digital terrain modeling (DTM) methods with KLT Atlas software. All units are in feet. Building Corners as shown represent roof lines as collected from aerial photography.

Overland flow directional arrows interpolated by Terracon Consultants, Inc.
Any user should determine the suitability of this aerial mapping for the intended use and assume all risk and liability in connection there with.

DATA SOURCES:
1940 Aerial: 400406-13-143
Eastern Topographics: 13391-1940-CC.dwg Group Layer
Eastern Topographics Digital file name 13391C-1961-CC.ATL

Horizontal Control: Extracted from NJOIT OGIS 2015 High Resolution Ortho.
Vertical Control: Extracted from 21-4 USGS New Jersey CMGP Sandy LIDAR.

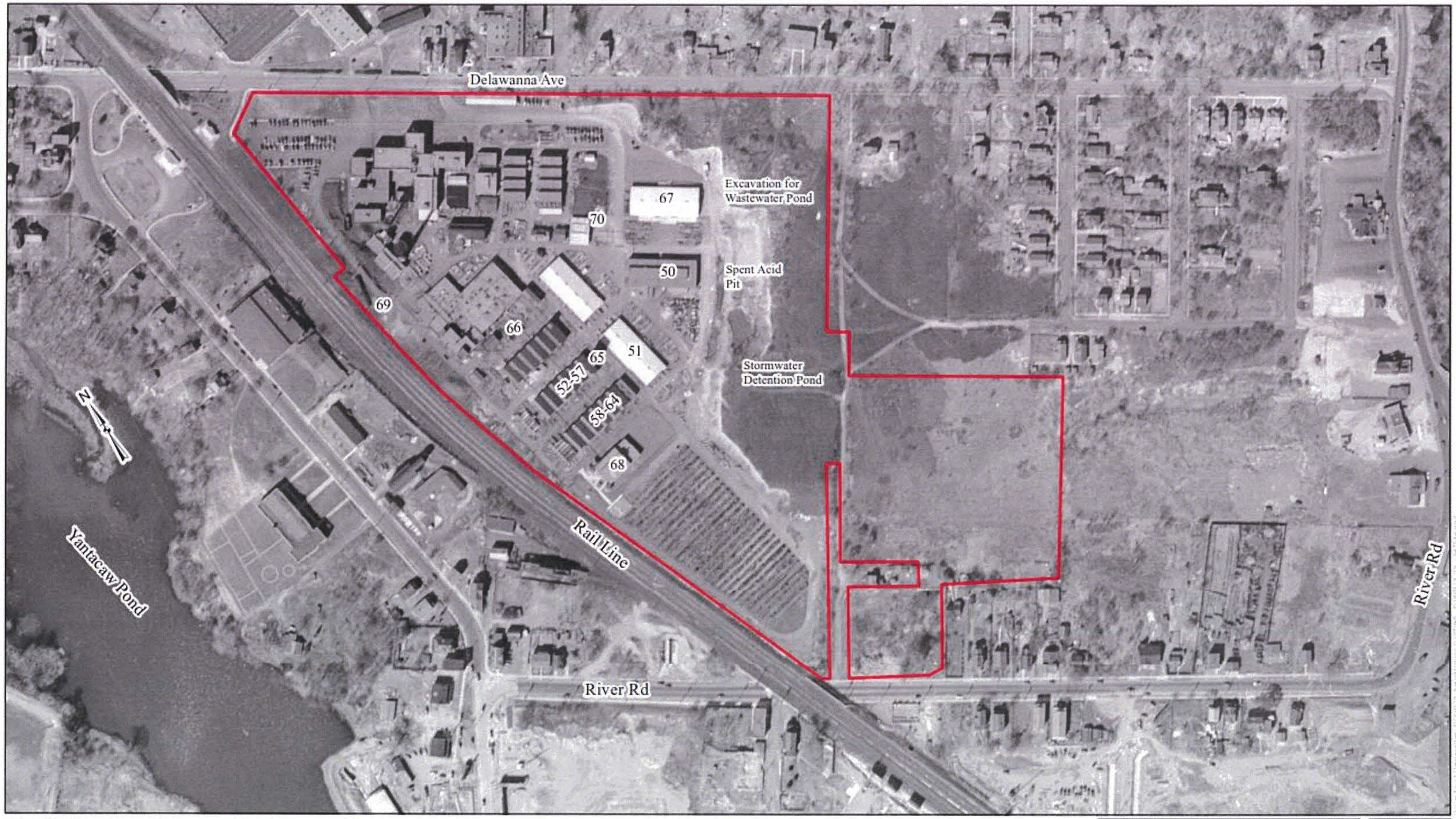
1940 Aerial Photo and Topography

Givaudan - Passaic
Clifton, NJ

Exhibit
7

1940 - Photogrammetry Evaluation

- Spot elevations and contours depict a grade change from the residential area, downward generally to the south-southwest.
- The highest spot elevation is 64.9 on the Y-shaped road, while the lowest spot elevation is within a depression 8.9 near the intersection of River Road and the railroad.
- Based on spot elevations and contours, as illustrated by the interpretational arrows on the photo, overland flow of precipitation falling on the site would have been toward the intersection of River Road with the railroad.



— Site Boundary

Feet
0 100 200 400
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

DATA SOURCES:
1947 Aerial: 470428-NJ-365
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1947 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	8

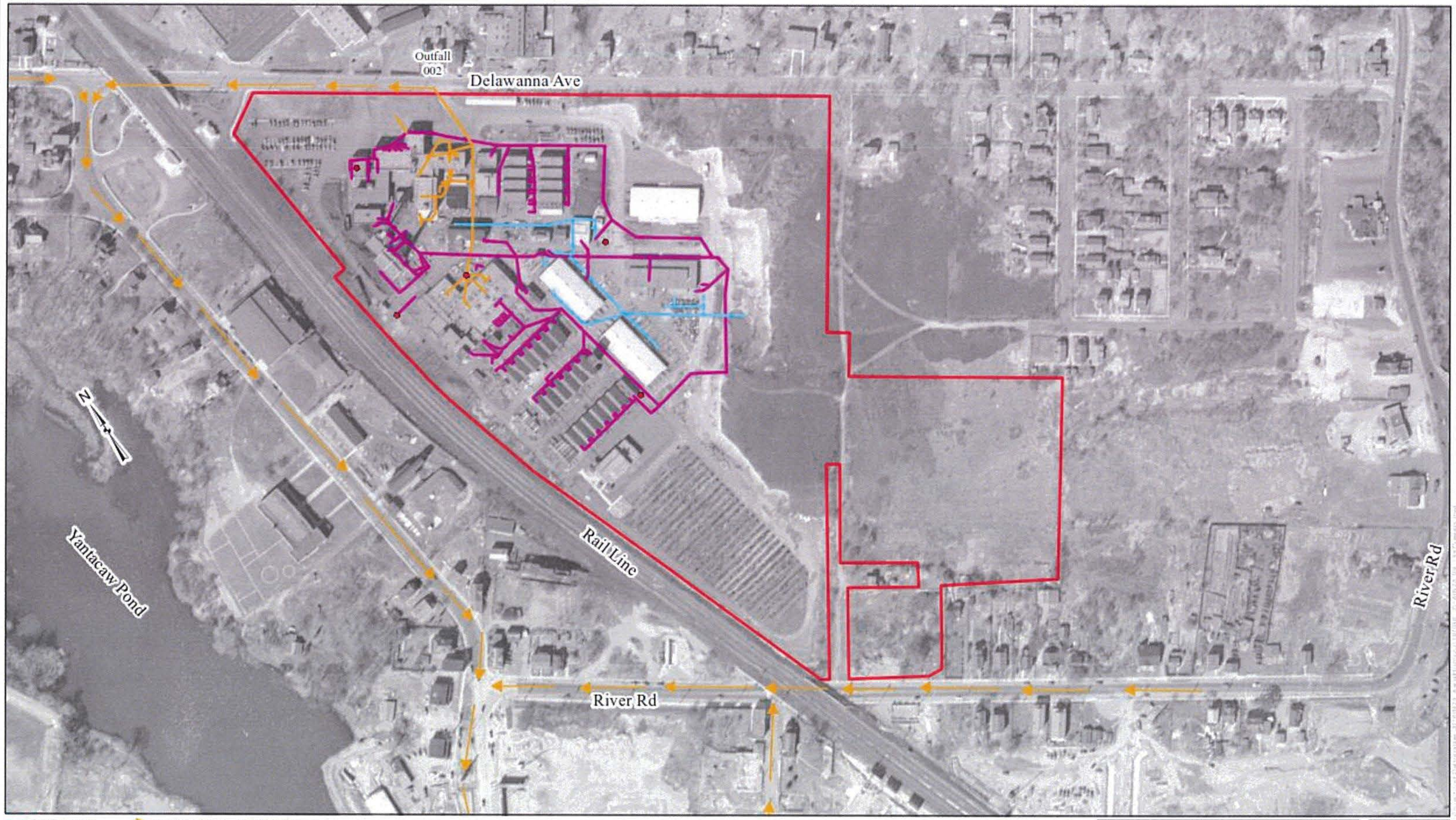
1947 – Site View

Observed Photograph Features

- Site continuing to expand southward along railroad tracks.
- Paving possible in parking areas in northern portion of site and travel lanes throughout the site.
- Increased outside storage observed south of newly constructed buildings and south of the process buildings.
- Excavation along eastern perimeter of site to facilitate expansion.
- Water is present in the Stormwater Detention Pond and the Spent Acid Pit.
- Excavation for the future Wastewater Detention Pond is visible.
- No channelized flow or surface drainage features noted on site.
- Yantacaw Pond appears unchanged.

Site Development Notes

- Buildings 50 (machine maintenance shop) and 51 (raw material storage) were constructed in 1940 (FMED, 1972).
- Additional process buildings (Buildings 52 to 65) were added to the south of previously constructed process buildings in 1940 and 1941 for the manufacturing of aromatic chemicals (FMED, 1972).
- Buildings 66 through 69 were constructed between 1940 and 1947 in the process area (FMED, 1972). Building 66 was used for storage; Building 67 for shipping and storage; Building 68 for warehousing; and Building 69 as a switch gear center.
- The Stormwater Detention Pond is called a “Drainage Pit” and indicated to be 15 feet deep (FMED, 1972).
- A 1986 air permit application states that operations beginning in 1947 used waste solvents and distillates as auxiliary fuel onsite.



— Site Boundary
— Chemical Sewer
— Sanitary Sewer
— Stormwater Sewer
PVSC Sanitary Sewer Direction
Dry Well

NOTES:
Analytical data compilation by Terracon Consultants, Inc.
All sewer maps provided by Givaudan.
Parcel boundaries and sewer lines are approximate.

Approximate site sewer line locations shown on this figure are based on interpretations from historical aerial imagery and revised 1970 and 1946 sewer plans.

DATA SOURCES:
1947 Aerial: 470428-NJ-365
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.
1946 Site Sewer Map: Sewer Lines: Plant - Sewer System, 1946, The Givaudan Corporation. Drawing A-2679.
1970 Site Sewer Map: Plant Sewer System, Givaudan Corproation, 1970. Drawing A-9258.
1927 PVSC Sanitary System: Sanitary Sewer Record Drawings: River Road, Seydel Ave, 1927.

0 100 200 400 Feet
1:2,400

1946 Sewer System Overlay	Exhibit
Givaudan - Passaic Clifton, NJ	9

1946 Sewer System Overlay

- Three primary systems appear active at the site, including:
  - Stormwater (blue) - discharging to the Stormwater Detention Pond
  - Sanitary (gold) – discharging to the City of Clifton Sewer at Outfall 002 on Delawanna Avenue
  - Chemical (purple) – discharging to dry wells throughout the site and to the Spent Acid Pit and the future Wastewater Detention Pond.
- Future aerial photos (see Exhibit 13) indicate the presence of the wastewater treatment building (Building 74). This building provided pre-treatment of process water (chemical system) prior to discharge to the City of Clifton Sewer at Outfall 001 on River Road.
- A series of drawings from 1927, titled "Sanitary Sewer Record Drawing" from the City of Clifton Bureau of Engineering, indicates city sanitary sewer lines were in place near the facility in 1927. As such, it is likely the facility's sanitary sewer system discharged to the City of Clifton system at Outfall 002 prior to 1946.
- A letter dated November 30, 1953 from Givaudan to the County Council, references an August 20, 1946 letter from City of Clifton to Givaudan that indicates the City and Givaudan were in discussions regarding the City's sewer system in 1946; suggesting Givaudan was connected in some capacity to the City sewer at that time.

Site Boundary

0 250 500 1,000 Feet

1:6,000

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

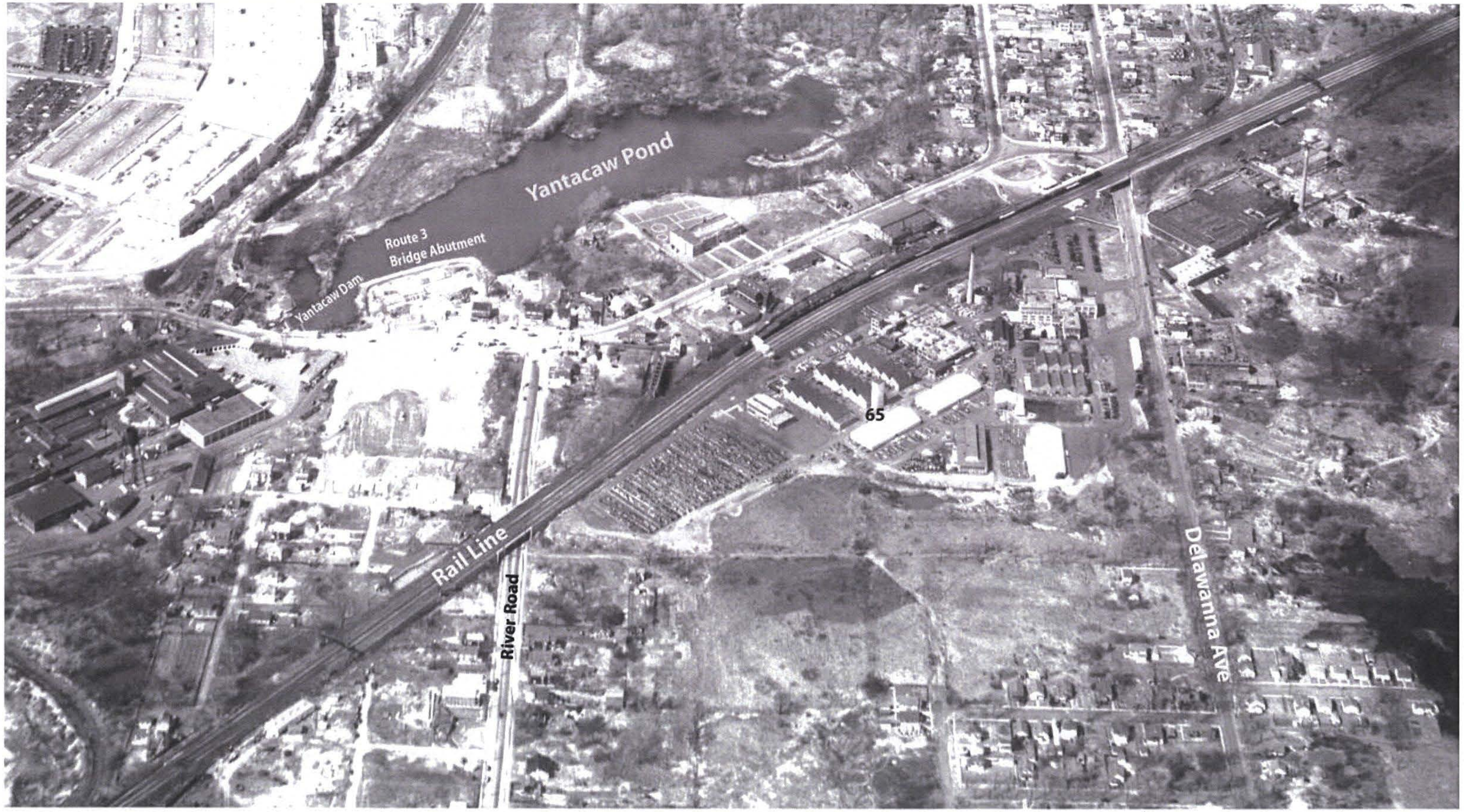
DATA SOURCES:
1947 Aerial: 470428-NJ-365
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1947 Aerial Imagery - Regional View	Exhibit
Givaudan - Passaic Clifton, NJ	10

1947 – Regional View

Observed Photograph Features

- Major construction generally south of site associated with Route 3.
- Route 3 appears to be an elevated construction.
- Land disturbance appears to be occurring generally north of the site in the large, undeveloped area.
- Apparent increase in residential and commercial/industrial development in the region, including between the site and the Passaic River and along River Road.
- Aboveground storage tanks observed between River Road and Passaic River.
- Large building has been constructed south of Yantacaw Pond and the man-made canal.



Notes:
Oblique perspective facing northwest

Data Source:
UCLA Air Photo Archive - Photo 94572 - 03-18-1947 _ Passaic _ and _Nutley _

1947 Oblique Aerial Imagery	Exhibit
Givaudan - Passaic Clifton, NJ	11

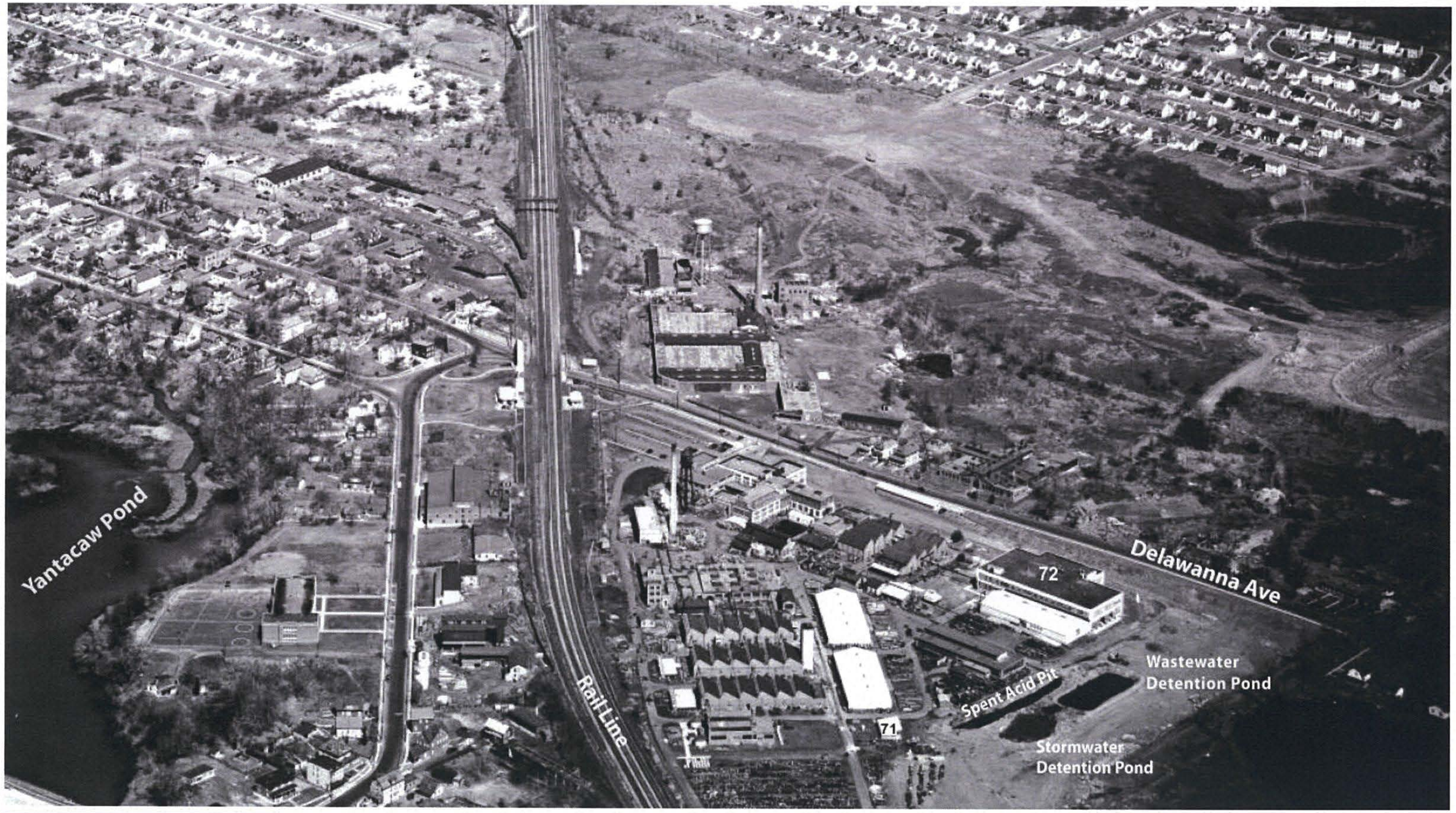
1947 – Oblique

Observed Photograph Features

- Increased storage south of newly constructed buildings and south of the process buildings.
- The Spent Acid Pit and, to a lesser extent, the Stormwater Detention Pond, appear to be local depressions with defined embankments/berms as sidewalls.
- No channelized flow or surface drainage features noted on site.
- Construction of the southern bridge abutment for Route 3 over Yantacaw Pond is visible.

Site Development Notes

- Manufacturing of aromatic chemicals was completed in the process buildings, including the multi-story Building 65, which is visible at the end of the center row of process buildings (FMED 1972).
- A handwritten note from June 1949 on a 1920 well log for a Givaudan water supply well indicates that according to the well driller (A.F. Rinbrand), there are 5 wells at the Delawanna plant and that waste is dumped into pits adjacent to the plant (Rimbrand, 1920 with June 15, 1949 note from H.H.).



Notes:
Oblique perspective facing north

Data Source:
490404_PFAIR001_103357

1949 Oblique Aerial Imagery	Exhibit
Givaudan - Passaic Clifton, NJ	12

1949 - Oblique

Observed Photograph Features

- Paving noted in parking areas in northern portion of site and potential travel lanes throughout site.
- A building has been constructed between an existing building and Delawanna Avenue in the eastern portion of the property.
- Increased outside storage in several areas of the site, nearby site buildings.
- Three surface water impoundments evident and containing water/liquids.
- The Stormwater Detention Pond, the Spent Acid Pit, and the Wastewater Detention Pond appear to be local depressions with defined embankments/berms as sidewalls.
- No channelized flow or surface drainage features noted on site.
- A larger area surrounding the impoundments has been leveled/excavated.
- An embankment is visible between the leveled area near the surface impoundments and Delawanna Avenue, which is topographically elevated.
- Substantial terrain variations and water features noted to the northeast of the site with a significant increase in residential development beyond.

Site Development Notes

- Building 71 constructed southeast of process buildings for storage of cylinders and Building 72 constructed in 1949 and primarily used for office and storage adjacent to Delawanna Avenue in the eastern portion of the site (FMED, 1972).
- A handwritten note from June 1949 on a 1920 well log for a Givaudan water supply well indicates that according to the well driller (A.F. Rimbrand), there are 5 wells at the Delawanna plant and that waste is dumped into pits adjacent to the plant (Rimbrand, 1920 with June 15, 1949 note from H.H.).

Notes:
Oblique provided by Givaudan. Oblique perspective facing south
Oblique assumed to be 1950 by Terracon Consultants, Inc. based on key site features

Data Source:
Plant_Old-lg.jpg

1950 Oblique Aerial Imagery	Exhibit
Givaudan - Passaic Clifton, NJ	13

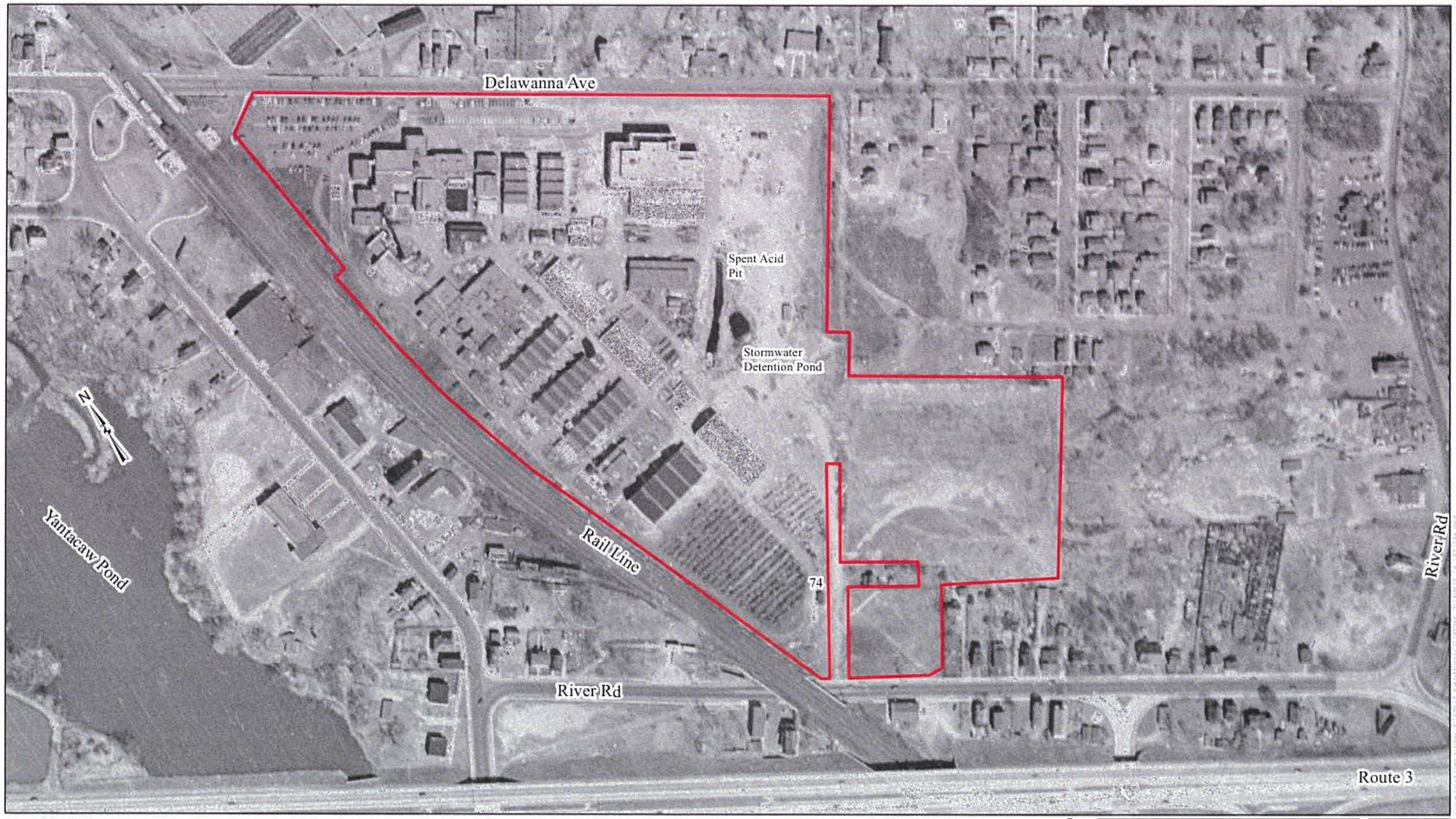
1950 - Oblique

Observed Photograph Features

- Several buildings have been constructed to the south of the process area.
- An embankment is visible at the top left corner of photo indicating the eastern perimeter of site is roughly 20 feet higher than the Givaudan site.
- Raised embankments/berms observed around stormwater pond and spent acid pit.
- The rectangular surface impoundment no longer appears to contain much water.
- No channelized flow or surface drainage features noted on site.
- Route 3 visible in the upper portion of the photo (southwest of the site). River Road passes under Route 3, which is elevated topographically compared to the site.

Site Development Notes

- Building 78 (storage) and Buildings 79 through 83 (manufacturing aromatic chemicals) were constructed in 1950, (FMED, 1972).
- Building 74, in the southernmost area of the site, is used for wastewater treatment prior to discharge to the off-site City of Clifton system.



— Site Boundary

0 100 200 400 Feet

1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this boundary.

DATA SOURCES:
1951 Aerial: 510407-289-2672
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1951 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	14

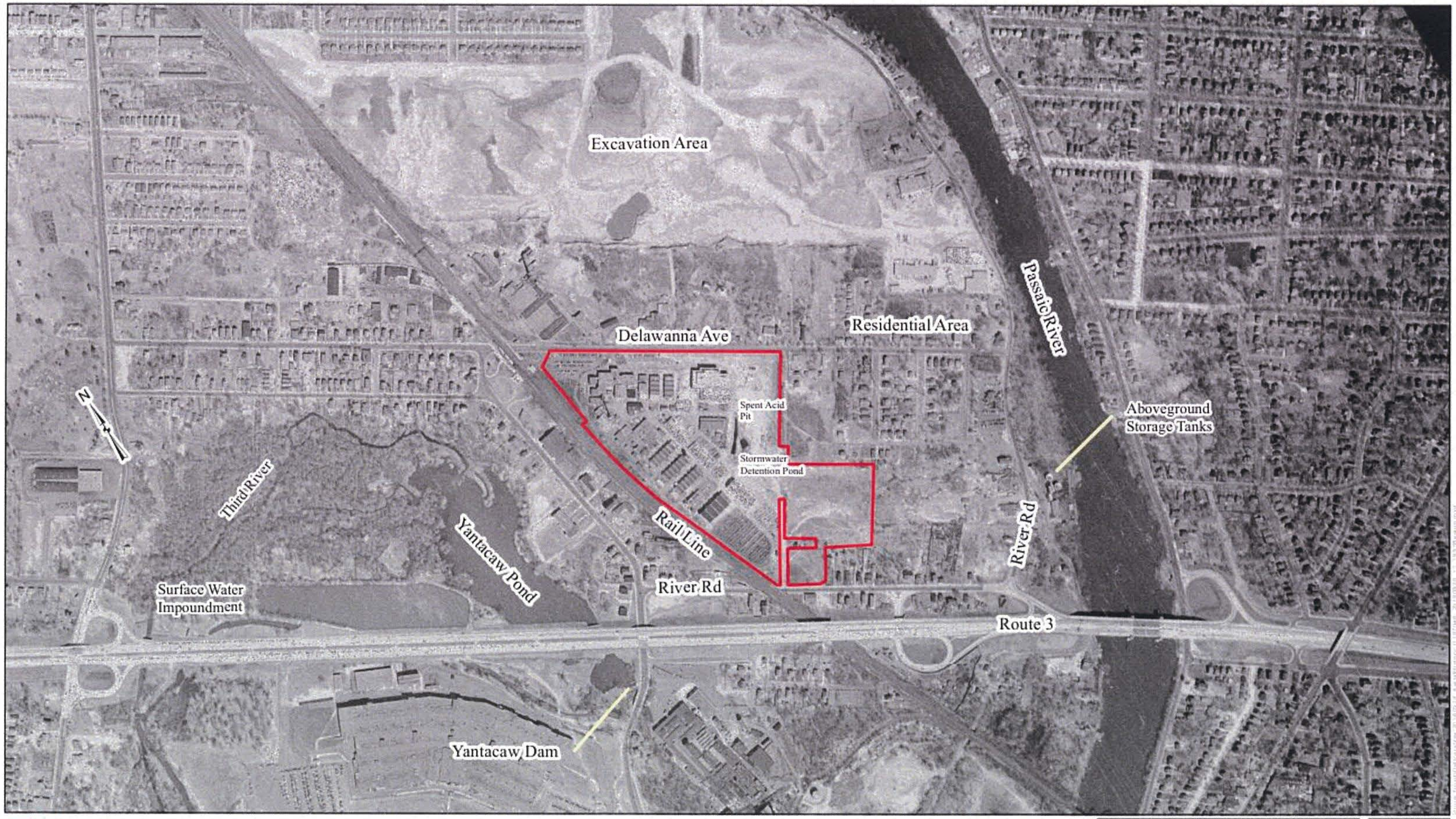
1951 – Site View

Observed Photograph Features

- Buildings constructed south of Process Area.
- Outside storage in several areas of the site.
- Rectangular surface impoundment (Wastewater Detention Pond) is no longer present and the area appears to have been re-graded.
- No channelized flow or surface drainage features noted on site.
- Significant clearing/excavation of land in the southernmost areas of the site.

Site Development Notes

- From 1950 to 1987, groundwater was continuously extracted and used a non-contact cooling water (~1 million gallons/week) then discharged to the PVSC (ERM, 2000).
- An August 27, 1951 report by Dr. G.C. Kitchens details the process for recovery of G-11 from sediment that "has collected in the pond, which was a part of our old sewer system". The letter indicates that samples of the sediment from the pond have been found to consist principally of G-11 (60%) and inorganic matter. The G-11 can be easily recovered as G-11 Pure by solvent or caustic extraction.
- The 1951 Sanborn Map indicates the former manufacturing facility north of Delawanna Avenue is owned by Hoffman-LaRoche Company, Inc. (Sanborn Library, LLC, 1951).



— Site Boundary

Feet
0 250 500 1,000
1:6,000

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

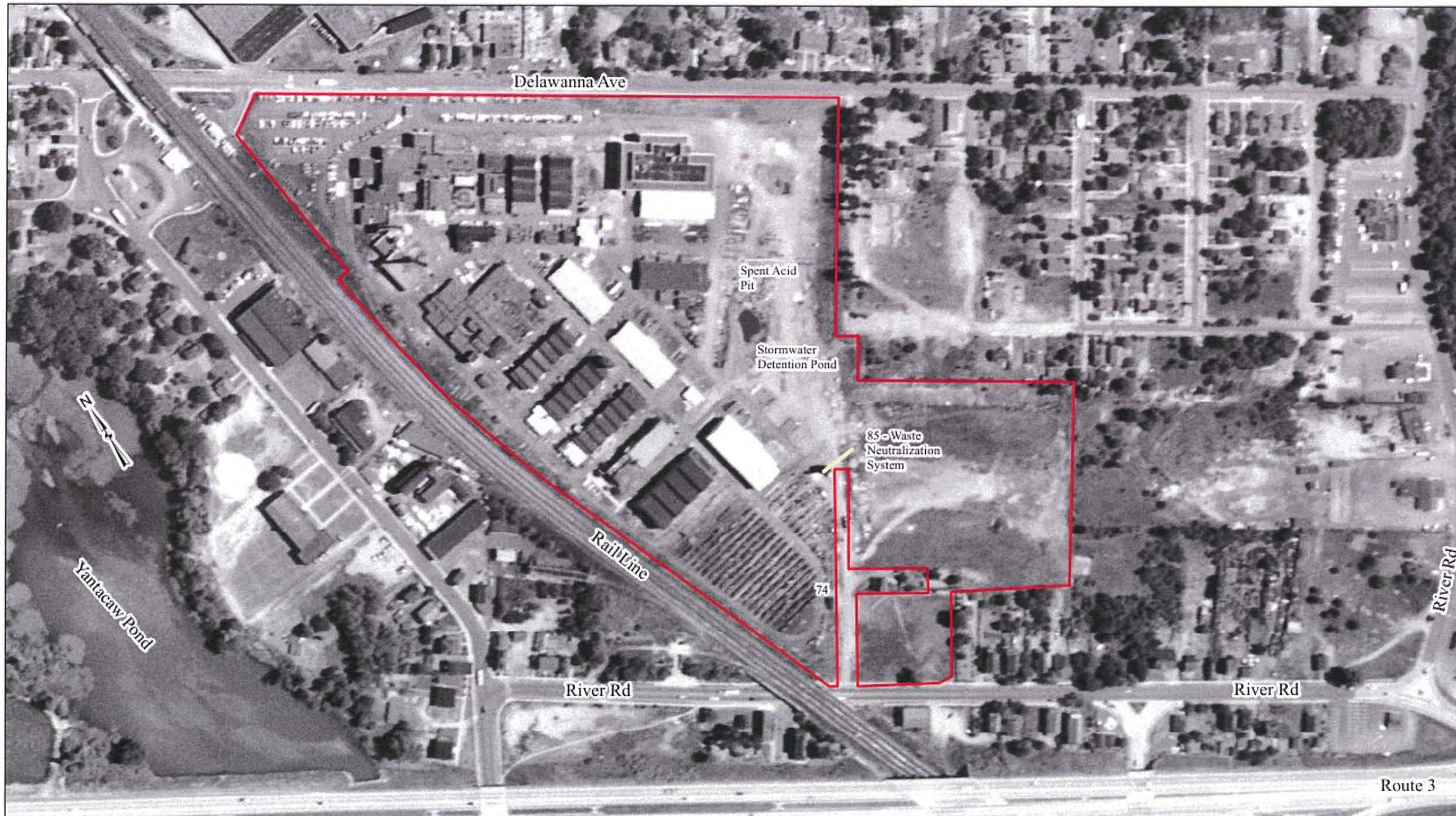
DATA SOURCES:
1951 Aerial: 510407-289-2672
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1951 Aerial Imagery - Regional View	Exhibit
Givaudan - Passaic Clifton, NJ	15

1951 – Regional View

Observed Photograph Features

- Route 3 appears to be an elevated construction.
- Significant clearing/excavation is occurring generally north of the site and industrial commercial properties are present closest to the Passaic River in this area.
- No significant change to residential areas and other buildings between the site and the Passaic River.
- Aboveground storage tanks observed between River Road and Passaic River.
- A likely man-made surface water impoundment is visible immediately north of Route 3 and adjacent to Yantacaw Pond. The construction of Route 3 disturbed the natural areal extent in the lower portions of Yantacaw Pond, restricting water flow under Route 3 and cutting off the canal that formerly entered into the southern end of the pond. The northern, natural tributary is still visible.



Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

DATA SOURCES:
1953 Aerial: AR1XI00000900(41-42)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1953 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	16

1953 – Site View

Observed Photograph Features

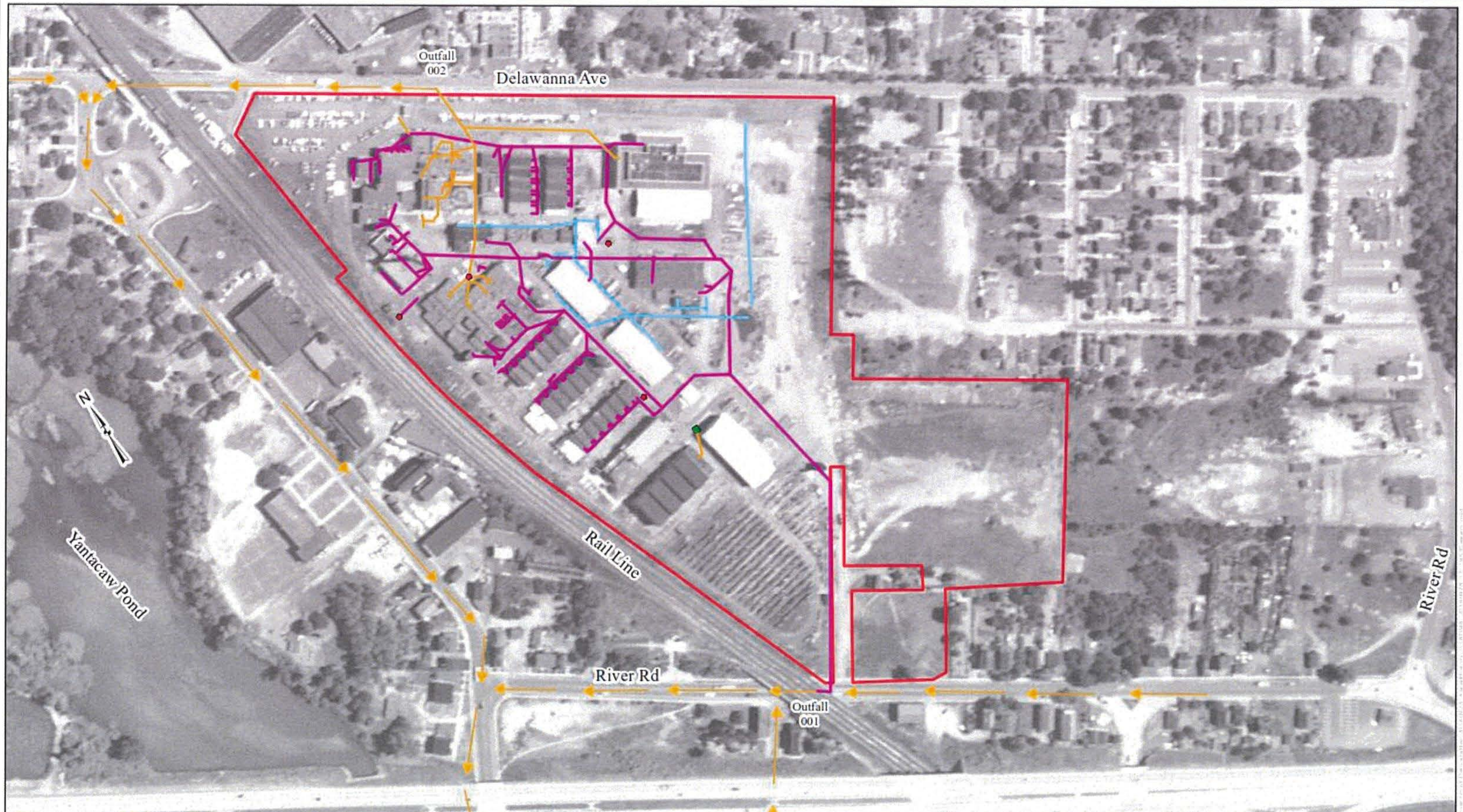
- New, tall structure (Building 85) present in the south-central portion of the site.
- Paving appears limited to the northern portions of the site, associated with parking.
- Outside storage in several areas continues to expand, including the Process Area.
- The linear surface impoundment (former Spent Acid Pit) next to the stormwater detention pond is not as prominent; there is little, to no, standing water visible.
- No channelized flow or surface drainage features noted on site.

Site Development Notes

- Building 85, identified as the waste neutralization system, is located in the area of the observed small, tall structure. (CFM Plate A, 1983).

1953 Sewer Overlay View

- Three primary systems appear active at the site, including:
  - Stormwater (blue) - discharging to the Stormwater Detention Pond.
  - Sanitary (gold) – discharging to the City of Clifton Sewer at Outfall 002 on Delawanna Avenue and on-site septic tanks.
  - Chemical (purple) – discharging to the City of Clifton Sewer at Outfall 001 on River Road.



Site Boundary
Chemical Sewer
Sanitary Sewer
Stormwater Sewer
PVSC Sanitary Sewer Direction
Dry Well
Septic Tank

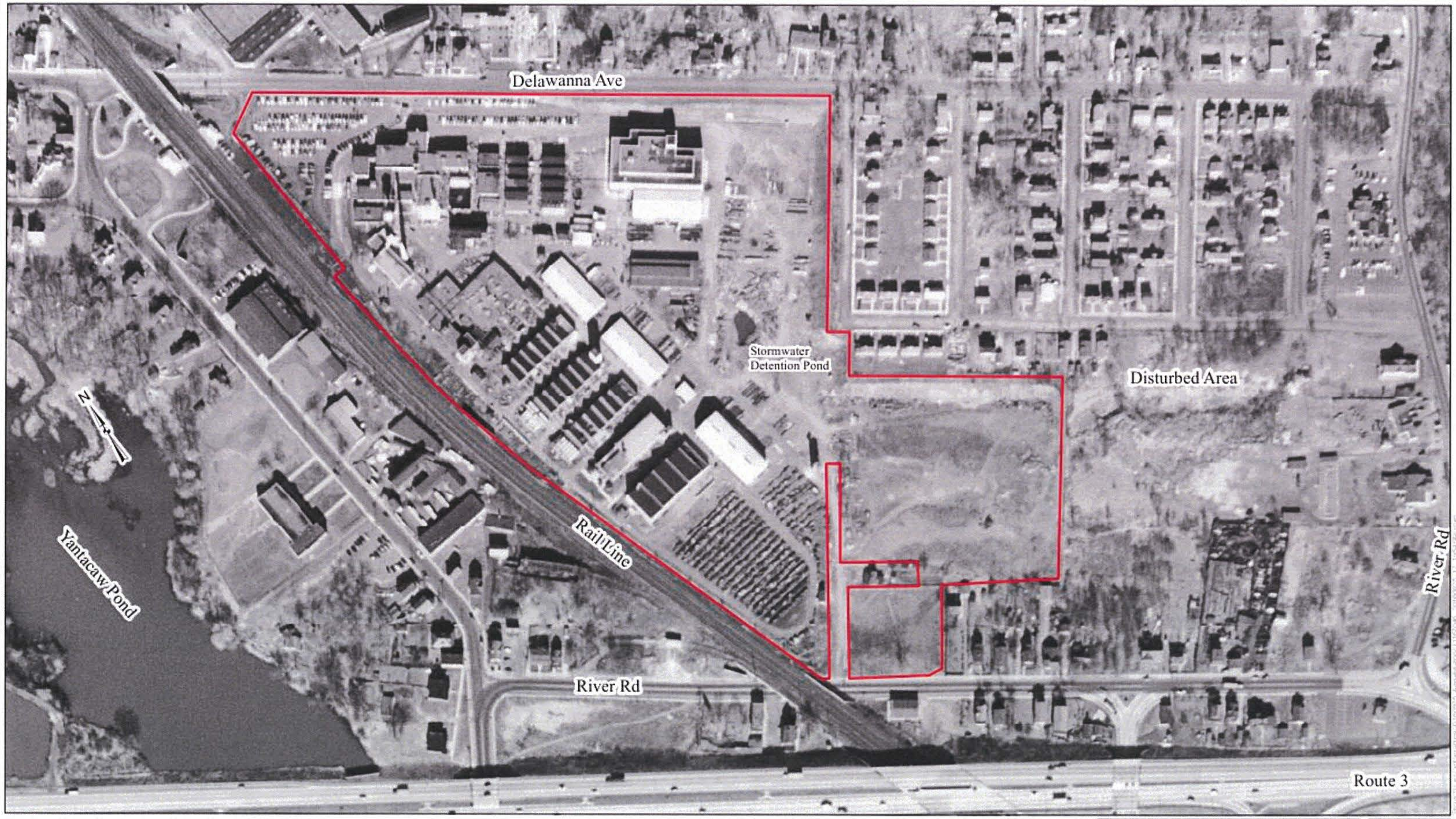
NOTES:
Analytical data compilation by Terracon Consultants, Inc.
All sewer maps provided by Givaudan.
Parcel boundaries and sewer lines are approximate.

Approximate site sewer line locations shown on this figure are based on interpretations from historical aerial imagery and revised 1970 and 1946 sewer plans.

DATA SOURCES:
1953 Aerial: AR1XI00000900(41-42)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.
1946 Site Sewer Map: Sewer Lines: Plant - Sewer System, 1946, The Givaudan Corporation. Drawing A-2679.
1970 Site Sewer Map: Plant Sewer System, Givaudan Corproation, 1970. Drawing A-9258.
1952 Sanitary Sewer Map: Plan and Profile: Sanitary Sewer/Delawanna Ave, 1952. Drawing E-13-442.
1927 PVSC Sanitary System: Sanitary Sewer Record Drawings: River Road, Seydel Ave, 1927. Drawing E-13-28.

0 100 200 400 Feet
1:2,400

1953 Sewer System Overlay	Exhibit
Givaudan - Passaic Clifton, NJ	17



— Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

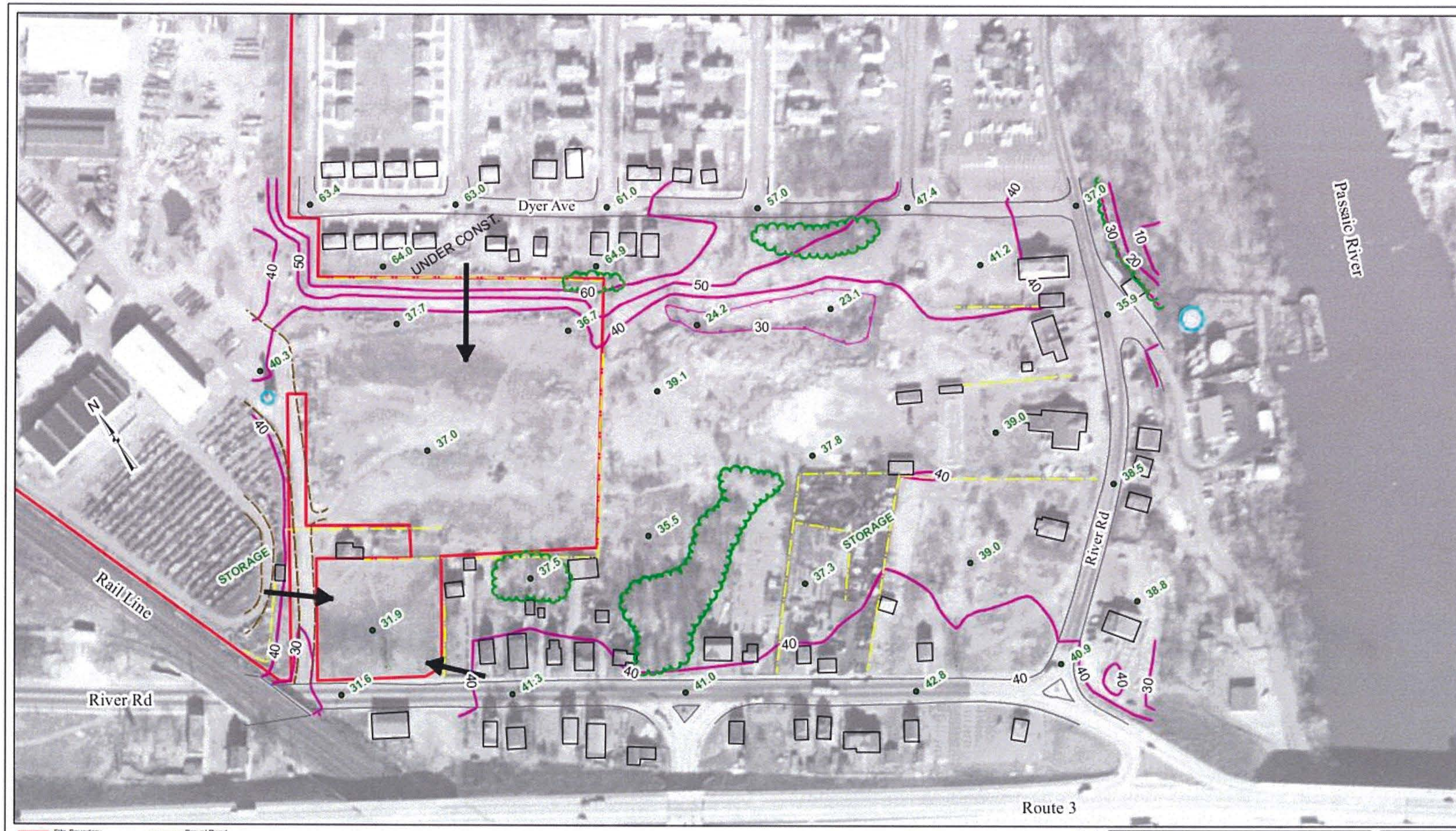
DATA SOURCES:
1954 Aerial: AR1VCN0000100(43-44)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1954 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	18

1954 – Site View

Observed Photograph Features

- No apparent changes to on-site infrastructure.
- Residential area on eastern side of site developed since 1953, between the site and the Passaic River.
- Linear surface impoundment feature (Spent Acid Pit) no longer present.
- No channelized flow or surface drainage features noted on site.
- Additional outdoor storage around the Stormwater Detention Pond and throughout site.
- Notable disturbed area southeast of site, below residential neighborhood.
- River Road in historical alignment; north/south parallel to the Passaic River to the east of the site.



Site Boundary
Contour Interval (10 feet)
Spot Elevation (# feet)
Building
Paved Road
Gravel Road
Fence
Vegetation
Tank
Interpolated Overland Flow Direction

NOTES:.
Elevation contours, spot elevations, and site features based on photogrammetric analysis by Eastern Topographics, Inc. for the aerial photo (shown as background) using digital terrain modeling (DTM) methods with KLT Atlas software. All units are in feet. Building Corners as shown represent roof lines as collected from aerial photography.

Overland flow directional arrows interpolated by Terracon Consultants, Inc.
Any user should determine the suitability of this aerial mapping for the intended use and assume all risk and liability in connection there with.

0 100 200 400 Feet
1:1,800

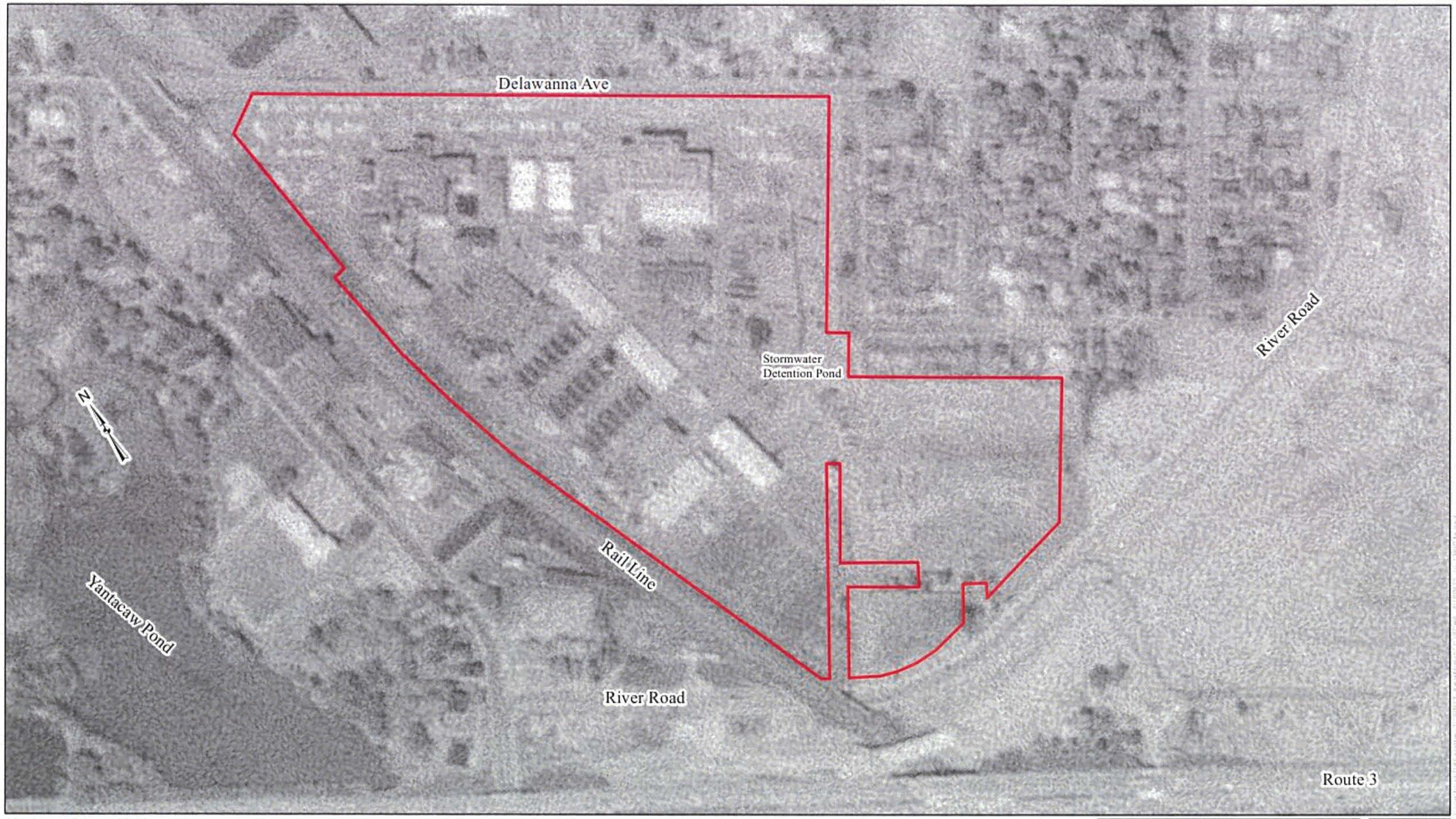
DATA SOURCES:
1954 Aerial: AR1VCN0000100(43-44)
Eastern Topographics: 13391B-1954-CC.dwg Group Layer
Eastern Topographics Digital file name 13391C-1961-CC.ATL

Horizontal Control: Extracted from NJOIT OGIS 2015 High Resolution Ortho.
Vertical Control: Extracted from 21-4 USGS New Jersey CMGP Sandy LIDAR.

1954 Aerial Photo and Topography	Exhibit
Givaudan - Passaic Clifton, NJ	19

1954 - Photogrammetry Evaluation

- Spot elevations and contours depict additional excavation and grading of the area immediately south of Dyer Avenue has occurred since 1940.
- The highest spot elevation is 64.9 in the residential area just south of Dyer Avenue, while the lowest spot elevation is 31.6 near the intersection of River Road and the railroad.
- Based on spot elevations and contours, as illustrated by the interpretational arrows on the photo, overland flow of precipitation falling on the site would have been toward the intersection of River Road with the railroad.
- The area that was formerly a topographic depression near River Road (see Exhibit 7) has been filled.



Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-9 are represented in this figure.

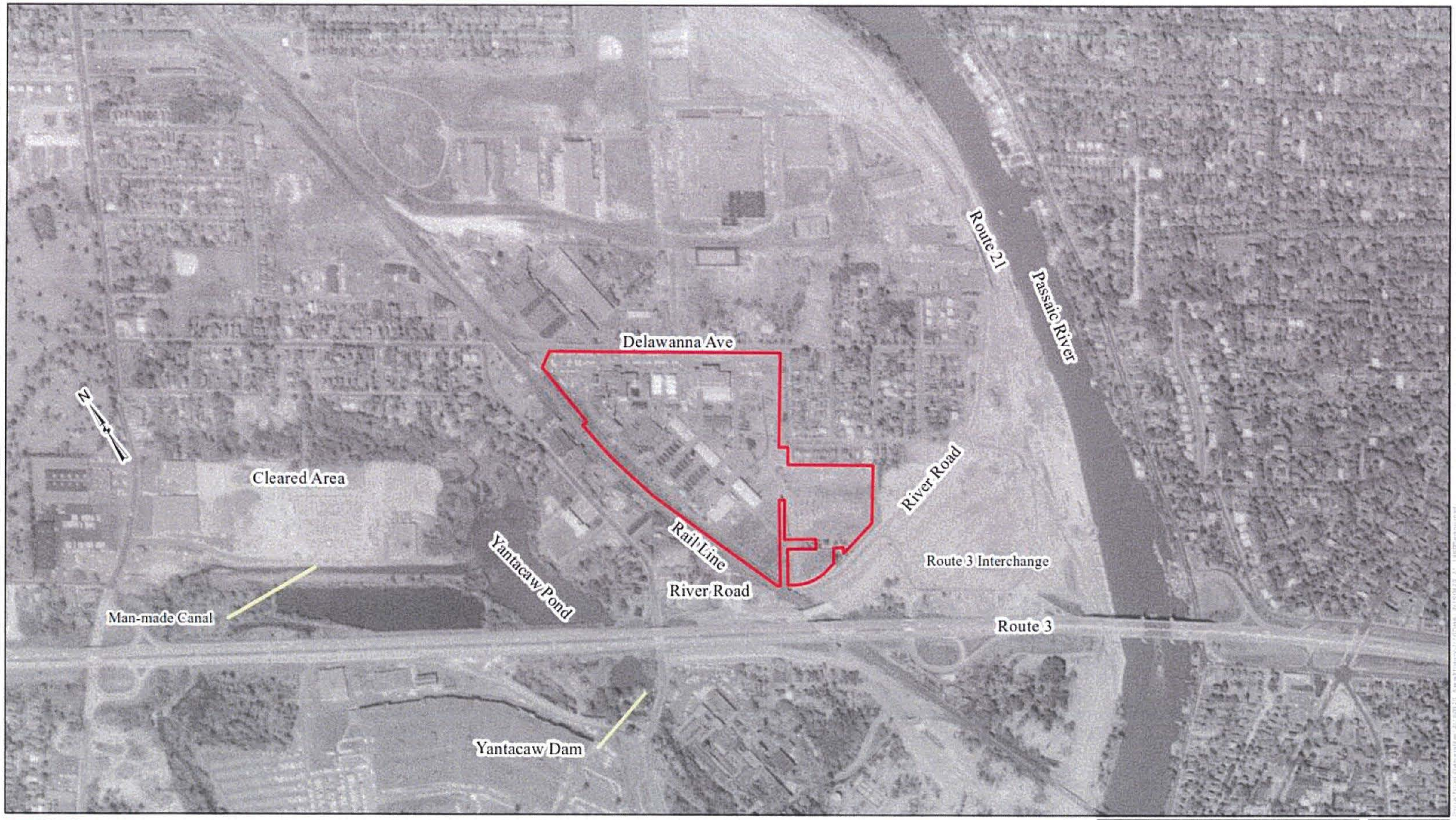
DATA SOURCES:
1960 Aerial: ARB593506606501
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1960 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	20

1960 – Site View

Observed Photograph Features

- Construction of new Route 3 interchange underway, along with re-alignment of River Road.
- Stormwater Detention Pond visible.



Site Boundary

0 250 500 1,000 Feet
1:6,000

NOTES:
Parcel boundaries are approximate. Parcels 1-9 are represented in this boundary.

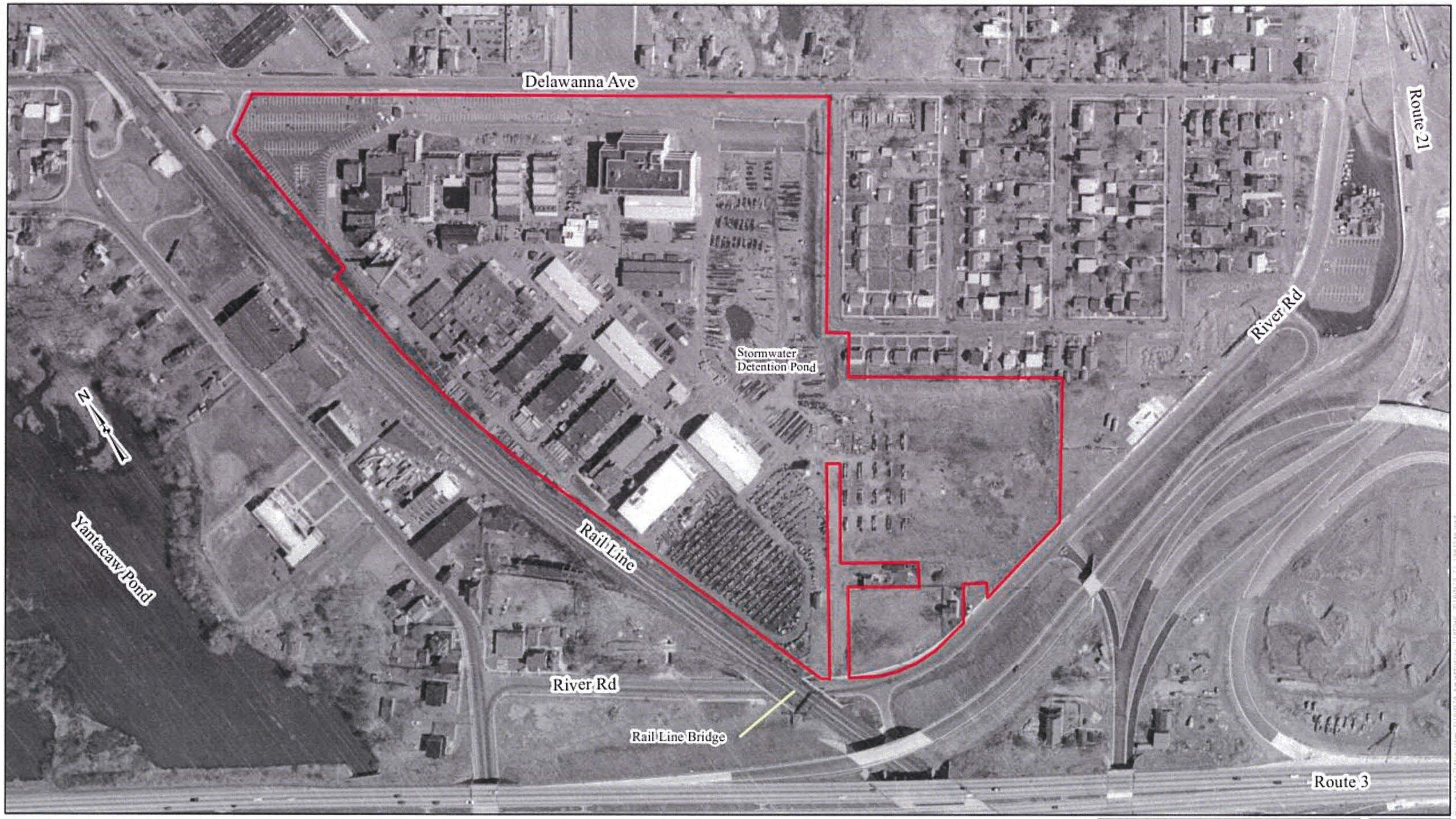
DATA SOURCES:
1960 Aerial: ARB593506606501
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1960 Aerial Imagery - Regional View	Exhibit
Givaudan - Passaic Clifton, NJ	21

1960 – Regional View

Observed Photograph Features

- Re-grading southeast of site for Route 3 interchange between the site and the Passaic River.
- Buildings formerly in the construction area have been removed.
- Construction would be elevated to allow intersection with elevated Route 3.
- Former undeveloped area generally north of site, now developed with industrial/ commercial infrastructure.
- A large area northwest of Yantacaw Pond has been cleared and several industrial/commercial buildings have been constructed. The re-grading has cut off the Third River natural tributary that formerly flowed from the south and entered Yantacaw Pond at the north end.
- A new man-made canal is present north of Route 3 that transports flow from the Third River tributary to the center of Yantacaw Pond.



— Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-9 are represented in this figure.

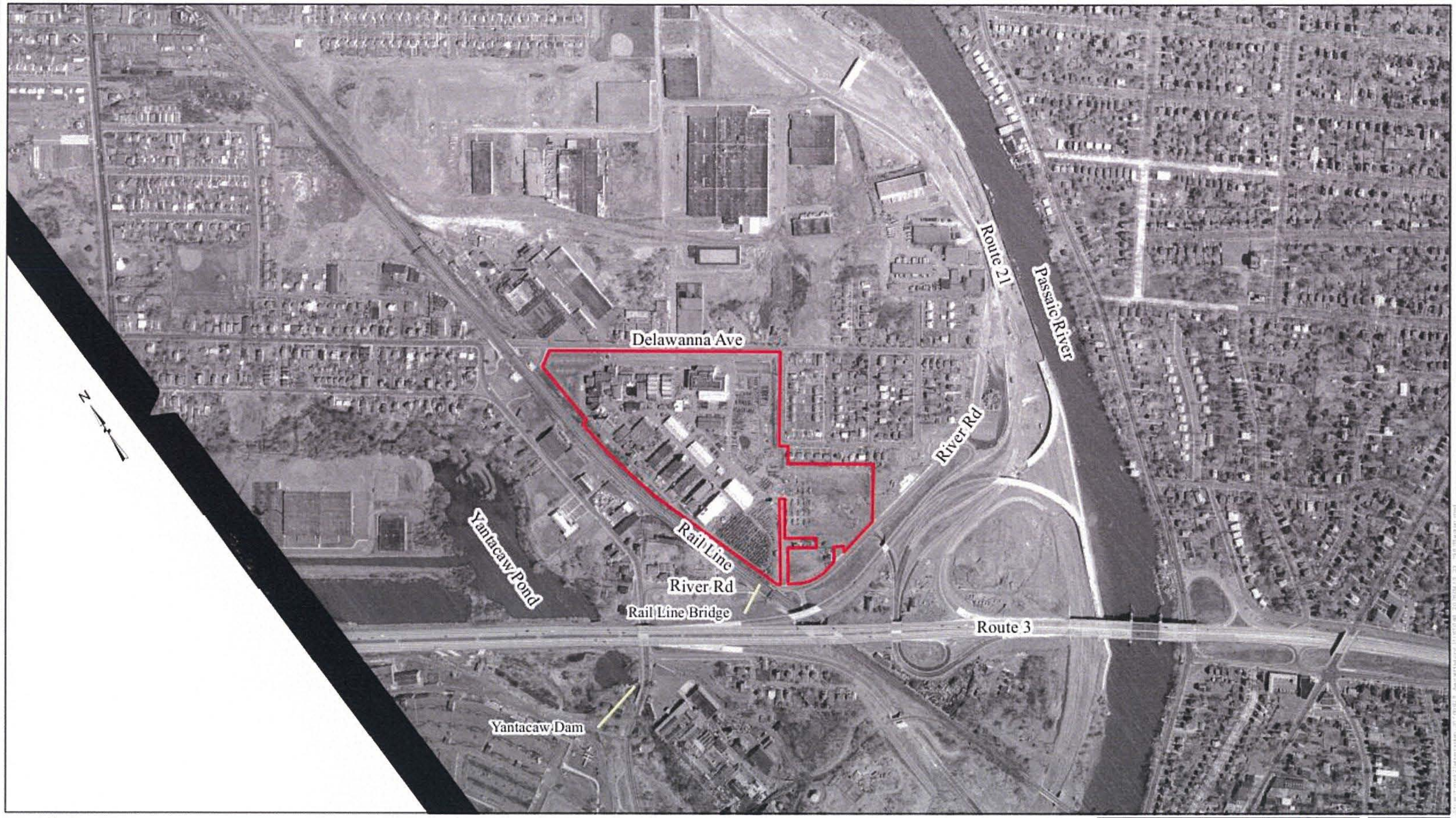
DATA SOURCES:
1961 Aerial: 610423-1116-13-1621
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1961 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	22

1961 – Site View

Observed Photograph Features

- No new on-site buildings observed.
- Storage around stormwater detention pond increased in size.
- No channelized flow or surface drainage features noted on site.
- Storage in southeastern portion of site begins.
- New Route 3 interchange construction complete on southern boundary of site; with re-alignment of River Road east of the rail line bridge and unchanged road alignment west of the railroad bridge.



Site Boundary

0 250 500 1,000 Feet
1:6,000

NOTES:
Parcel boundaries are approximate. Parcels 1-9 are represented in this figure.

DATA SOURCES:
1961 Aerial: 610423-1116-13-1621
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1961 Aerial Imagery - Regional View	Exhibit
Givaudan - Passaic Clifton, NJ	23

1961 - Regional View

Observed Photograph Features

- New Route 3 interchange construction complete on southern boundary of site; with re-alignment of River Road east of the rail line bridge and unchanged road alignment west of the rail line bridge.
- Interchange appears elevated relative to surrounding topography.
- Construction has begun on Route 21 north of Route 3.
- Additional buildings have been constructed in the cleared area northwest of Yantacaw Pond
- A northern tributary to Yantacaw Pond is visible; however, the majority of flow from the Third River, upstream of Yantacaw Pond, appears to come through the man-made canal south west of the cleared area.

1961 - Photogrammetry Evaluation

- Spot elevations and contours depict significant changes to local topography based on the construction of the Route 3 interchange.
- Grading appears to have created a linear topographic high (i.e., berm) near the easternmost property boundary, which would act as a barrier to overland flow.
- The embankment for the Route 3 interchange includes the 40-foot and 50-foot contours, while the highest spot elevation on the easternmost portion of the facility is 39.6.
- Based on spot elevations and contours, as illustrated by the interpretational arrows on the photo, overland flow of precipitation falling on the site would have been toward River Road.

Site Boundary
Contour Interval (10 feet)
Spot Elevation (# feet)
Building
Paved Road
Gravel Road
Concrete
Fence
Tank
Interpolated Overland Flow Direction

NOTES:
Elevation contours, spot elevations, and site features based on photogrammetric analysis by Eastern Topographics, Inc. for the aerial photo (shown as background) using digital terrain modeling (DTM) methods with KLT Atlas software. All units are in feet. Building Corners as shown represent roof lines as collected from aerial photography.

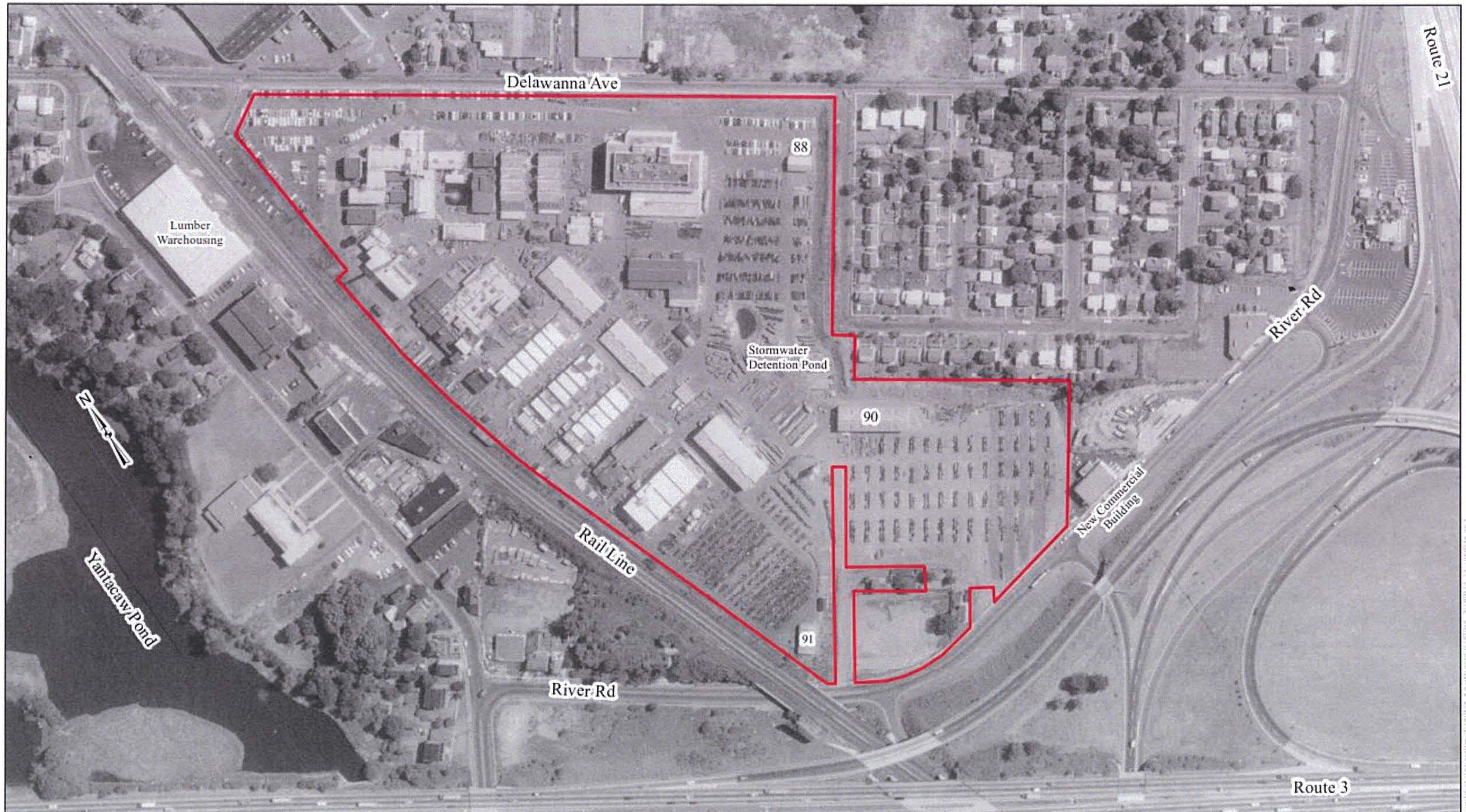
Overland flow directional arrows interpolated by Terracon Consultants, Inc.
Any user should determine the suitability of this aerial mapping for the intended use and assume all risk and liability in connection there with.

0 100 200 400 Feet
1:1,800

DATA SOURCES:
1961 Aerial: 610423-1116-13-1621
Eastern Topographics: 13391-1940-CC.dwg Group Layer

Eastern Topographics Digital file name 13391C-1961-CC.ATL
Horizontal Control: Extracted from NJOIT OGIS 2015 High Resolution Ortho.
Vertical Control: Extracted from 21-4 USGS New Jersey CMGP Sandy LIDAR.

1961 Aerial Photo and Topography	Exhibit
Givaudan - Passaic Clifton, NJ	24



— Site Boundary

NOTES:
Parcel boundaries are approximate. Parcels 1-9 are represented in this figure.

DATA SOURCES:
1966 Aerial: 660622-EQS_1GG_120
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule. December 1998.

Feet 0 100 200 400
1:2,400

1966 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	25

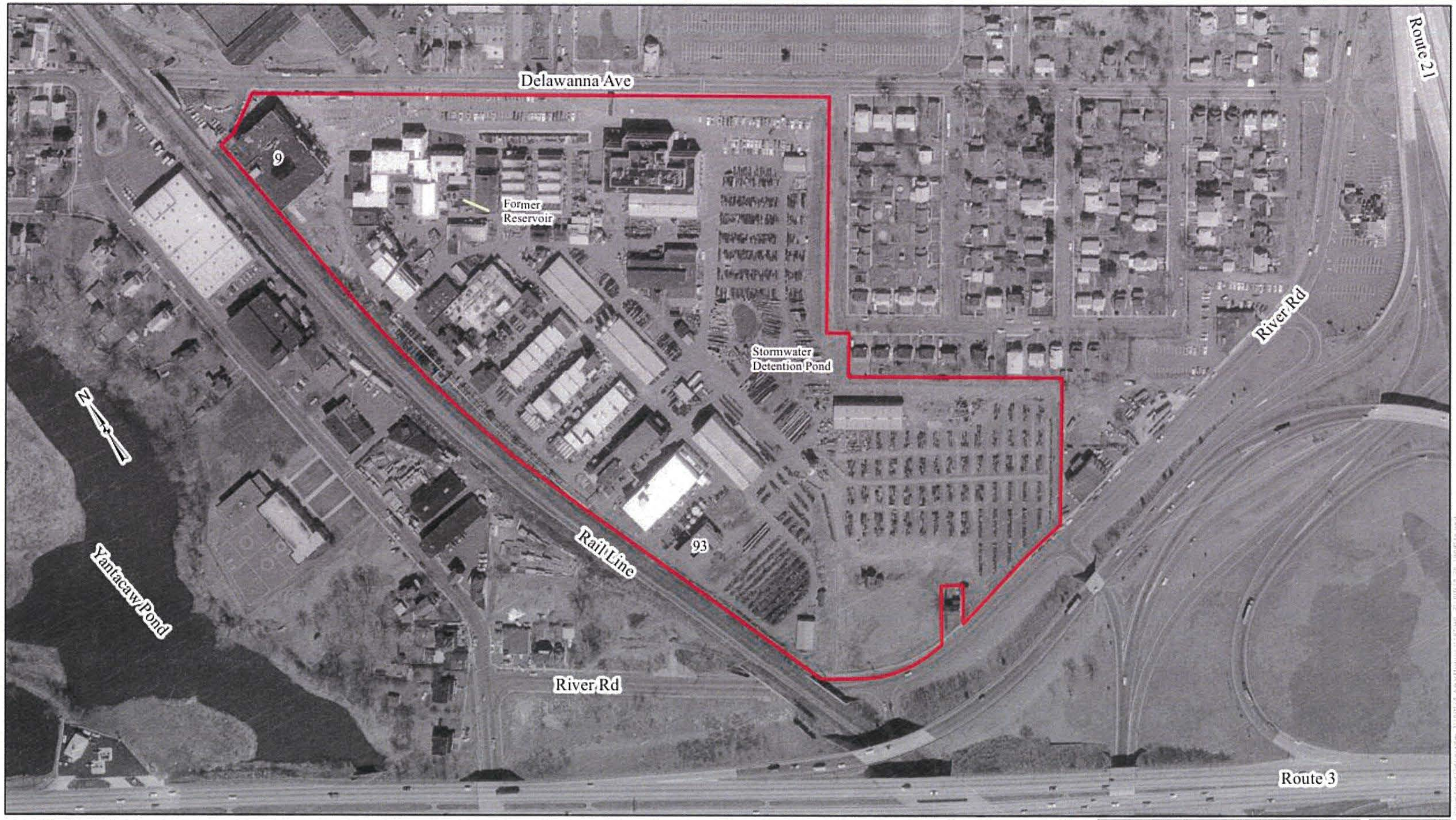
1966 – Site View

Observed Photograph Features

- Three additional buildings constructed; one in easternmost corner of site, a second in the southern portion of the site and a third in the area where River Road intersects the rail line.
- A group of the buildings visible on the 1931 aerial photo have been consolidated in the northern portion of the site.
- Significant increase of outdoor storage in southeastern portions of site and around stormwater detention pond.
- No channelized flow or surface drainage features noted on site.
- Yantacaw Pond apparent reduction in open water visible.

Site Development Notes

- Building 88 was constructed in easternmost corner of site, Building 90 (1962) in the southern portion of the site and Building 91 (1964) where River Road intersects the rail tracks. These buildings were used for storage (FMED, 1972).
- A new lumber warehousing building has been constructed between the site and Yantacaw Pond (The Sanborn Library, LLC, 1970).
- A new commercial building has also been constructed to the south of the site, on River Road. The use of this building at the time is unknown.



Site Boundary

Feet
0 100 200 400
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-17 are represented in this figure.

DATA SOURCES:
1969 Aerial: 690407-1752-33-1830
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1969 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	26

1969 – Site View

Observed Photograph Features

- Two new buildings observed in the photo, including one in the southernmost portion of the site and a second in the northern portion of the site.
- Number of storage piles in southeastern part of the site increased.
- No channelized flow or surface drainage features noted on site.

Site Development Notes

- Building 93 (1967-1968) was constructed in southern area of property and Building 9 (1969-1970) was constructed in northernmost portion of site, in an area that was formerly parking lot. (FMED, 1972).

— Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-17 are represented in this figure.

DATA SOURCES:
1970 Aerial: AR1VCLD000100(49,56,57)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1970 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	27

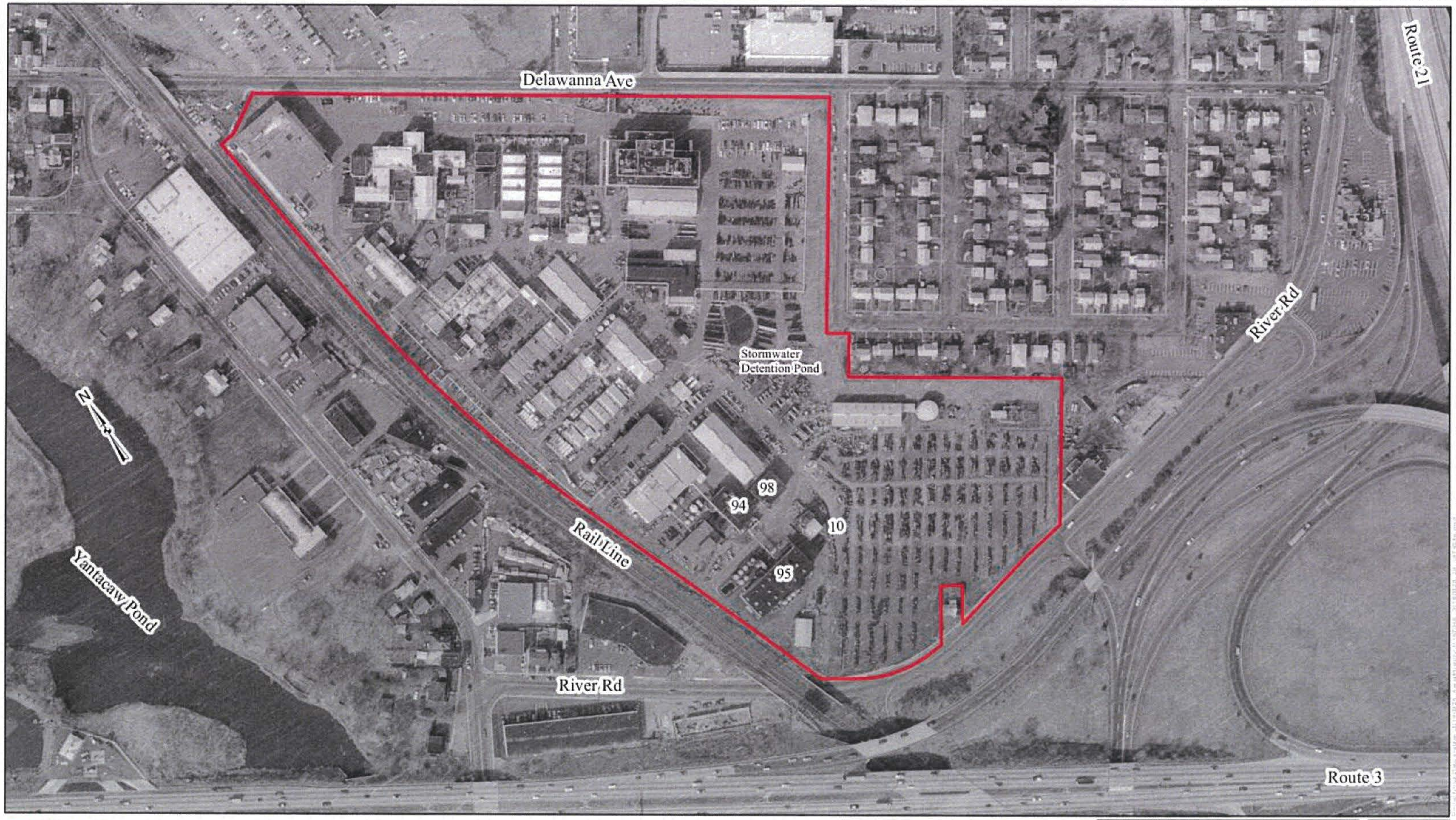
1970 – Site View

Observed Photograph Features

- Areas of drum storage relocated to southernmost area of site and organized.
- Large aboveground storage tank constructed in southern area of site, adjacent to an existing building.
- On-going construction for a future building in the southwestern portion of the site observed.
- No channelized flow or surface drainage features noted on site.

Site Development Notes

- The large aboveground storage tank (Building 96) was constructed adjacent to Building 90 and is labeled as “350,000 Gal Suction Tank”. (FMED, 1972).
- Building 99 was constructed further to the southeast, to house switchgear for electrical transformers (FMED, 1972).



Site Boundary

Feet
0 100 200 400
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-17 are represented in this boundary.

DATA SOURCES:
1974 Aerial: 740411-2063-43-5920
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1974 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	28

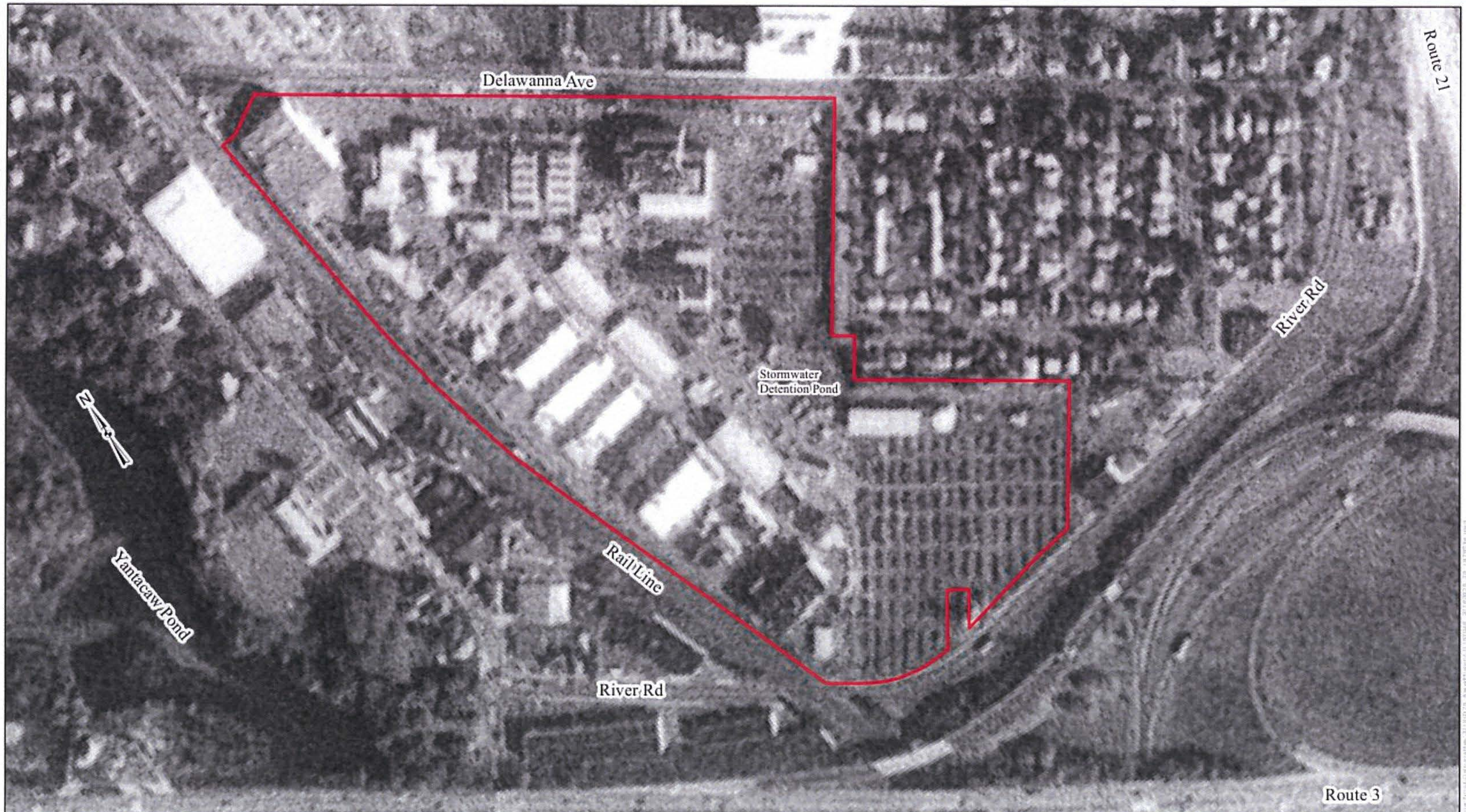
1974 – Site View

Observed Photograph Features

- Four buildings constructed in southern portion of site, where area of active construction was noted in 1970 aerial.
- Aboveground piping in various areas of site. Unknown use.
- No channelized flow or surface drainage features noted on site.
- Continued decrease in aerial extent of Yantacaw Pond.

Site Development Notes

- A 1972 site plan indicates the following buildings were constructed in the southernmost area of the site (FME, 1972):
  - Building 10 – Treatment Station for Cooling Tower
  - Building 94 – Process Engineering
  - Building 95 – Multipurpose Plant
  - Building 98 – Lunch and Locker Room



— Site Boundary

Feet
0 100 200 400
1:2,400

NOTES:
Parcel boundaries are approximate.

DATA SOURCES:
1976 Aerial: AR1VDUW00050023
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1976 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	29

1976 – Site View

Observed Photograph Features

- Blurry photo, no apparent site changes
- Continued decrease in aerial extent of Yantacaw Pond, with delta observed.

Site Boundary

Feet
0 100 200 400
1:2,400

NOTES:
Parcel boundaries are approximate

DATA SOURCES:
1979 Aerial: 790322-8-5964
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1979 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	30

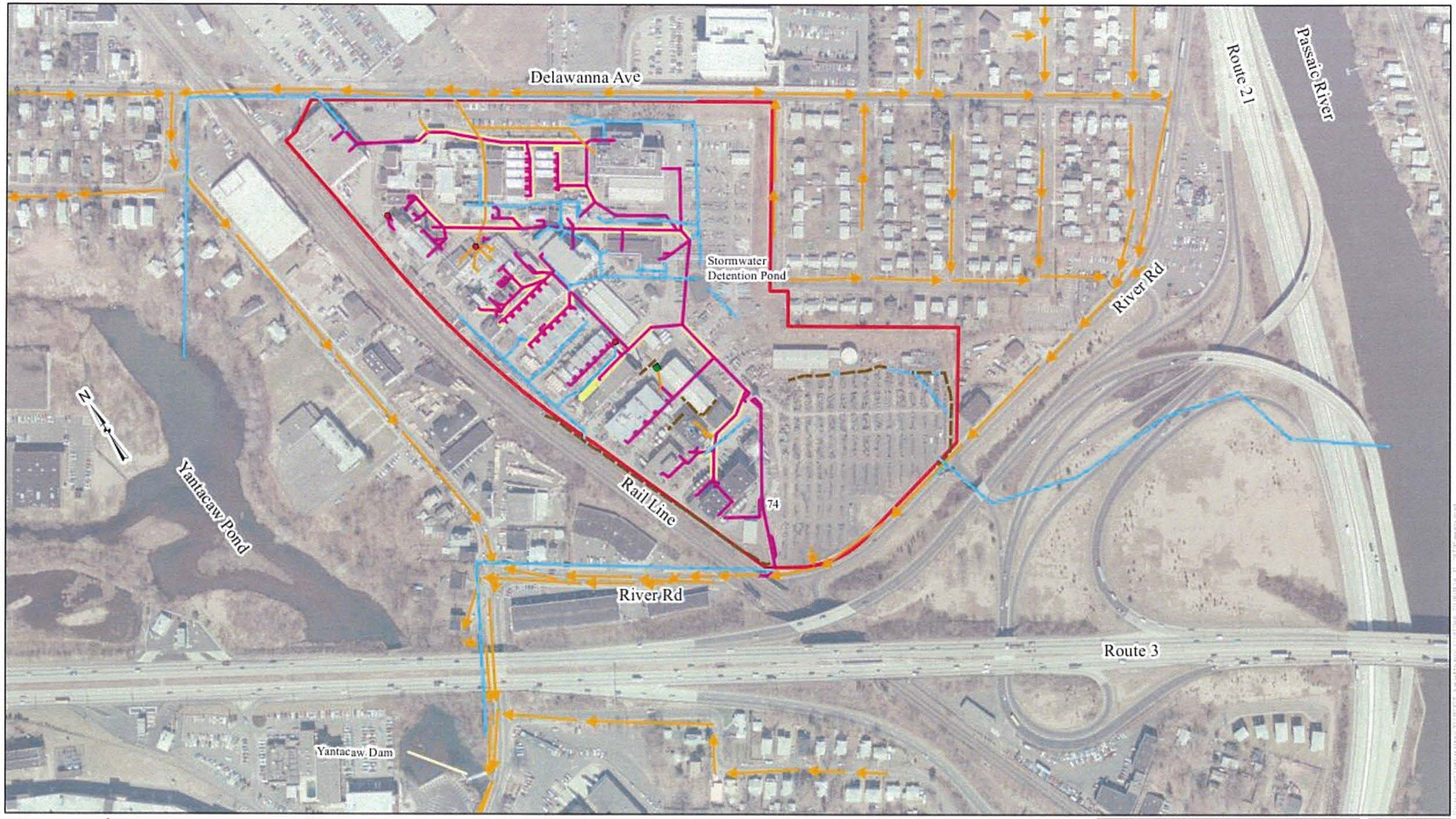
1979 – Site View

Observed Photograph Features

- A building in the center of the property was replaced with a new building.
- Stormwater detention pond still present.
- No channelized flow or surface drainage features noted on site.
- This photo appears to be most representative of the maximum buildout of the Givaudan site, as well as the area immediately surrounding the site.
- Yantacaw Pond Dam, located as water passes under Route 3 is still in place (Rimbach 1989, *The Record*); however, aerial extent of the pond is continuing to decrease.

Site Development Notes

- Building 200 (1979), in the center of the property, replaced Building 48, constructed circa 1940. (FMED, 1972).
- A 1986 air permit application states that operations beginning in 1947 used waste solvents and distillates as auxiliary fuel onsite.



Site Boundary
Chemical Sewer
Sanitary Sewer
Stormwater Sewer
Swale
Dry Well
Septic Tank
Poor Condition Sewers (Possible Exfiltration)
PVSC Sanitary Sewer Direction

NOTES:
Analytical data compilation by Terracon Consultants, Inc.
All sewer maps provided by Givaudan.
Parcel boundaries and sewer lines are

DATA SOURCES:
1979 Aerial Image: 790322-8-5964.
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.
1970 Site Sewer Map : Plant Sewer System, Givaudan Corproation, 1970. Drawing A-9258.
Sanitary Sewer: Master Map, Sanitary Sewer System. City of Passaic.
1982 Chemical Sewer Investigation: Chemical Sewer Investigation Chemical Plant. CFM Incorporated. 1983. Drawing A-9475.
Stormwater Outfalls: Givaudan-Roure River Road - Water Problem Report. Corporate Environmental

Feet
0 100 200 400
1:3,000

1979 Sewer System Overlay	Exhibit
Givaudan - Passaic Clifton, NJ	31

1979 Sewer System Overlay

- Three primary systems appear active at the site, including:
  - Stormwater (blue) - discharging to the Stormwater Detention Pond.
  - Sanitary (gold) – discharging to the City of Clifton Sewer at Outfall 002 on Delawanna Avenue and on-site septic tanks.
  - Chemical (Purple) – discharging to the City of Clifton Sewer at Outfall 001 on River Road.
- Chemical sewer lines with system with yellow highlights represent areas of poor condition lines (e.g., exfiltration areas) identified during a 1980s investigation.
- Brown dashed lines indicate areas of open storm water ditches.
- Chemical sewer system passes through Building 74 prior to leaving the site at River Road. Building 74 was first observed in the 1951 aerial photo.

1982 Topographic Survey overlaid on 1979 Aerial

- Cut bank along eastern boundary of site associated with topographic grade increase along property boundary.
- No channelized flow or surface drainage features noted on site.
- Elevated “roads” through southern outdoor storage area and from wastewater treatment buildings towards River Road.
- Topographic low for the property is near the intersection of the rail line and River Road.

Site Boundary

Major Contour 2.5 ft

Minor Contour 0.5 ft

Stormwater Detention Pond Wet Elevation

NOTES:
Parcel Boundaries are approximate.

Original topographic survey conducted in 1982 by Edward G. Duckinfield Jr. of John G. Reutter Associates. The survey was provided by Givaudan and digitized by Terracon Consultants, Inc. in 2016 using ArcGIS.

DATA SOURCES:
1979 Aerial: 790322-8-5964

Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

0 100 200 400 Feet

1:2,427

1982 Site Topography	Exhibit
Givaudan - Passaic Clifton, NJ	32

Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel Boundaries are Approximate.

DATA SOURCES:
1995 Historic Aerial: 1995_03_GoogleEarth
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1995 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	33

1995 Site View

Observed Photograph Features

- One new building present in southernmost area of the facility.
- Many of the buildings constructed in northern portion of the property during original development of the site, prior to 1930, appear to have been demolished (e.g., Buildings 7, 34, 36).
- Other demolition activities appear to be ongoing at the site (e.g., Building 51 has been demolished in the center of the facility).
- Areas of outside storage have significantly decreased.
- No channelized or surface drainage features noted on site.
- Yantacaw Pond completely absent, but Third River and higher tributaries remain.

Site Development Notes

- Building 210, a wastewater treatment building, is present in the southermost area of the facility.
- In 1989, Yantacaw Dam suffered complete failure due to heavy rains, causing Yantacaw Pond to decrease in size (Rimbach 1989, *The Record*).

Site Boundary

NOTES:
Parcel boundaries are approximate.

DATA SOURCES:
2002 Aerial: ARUNJOGIS090110
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

0 100 200 400 Feet
1:2,400

2002 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	34

2002 – Site View

Observed Photograph Features

- Property re-development apparent.
- Presence of TCDD containment cell noticeable (constructed in 1998) with on-going construction in southern areas of the former site.
- Yantacaw Pond completely absent, but Third River and higher tributaries remain.

Site Development Notes

- Givaudan facility ceased operations in 1998.
- March 21, 2002: No Further Action decision for TCDD contaminated soil (March 12, 2002 NJDEP letter from B. Venner to J. Vernieri of Givaudan).
- Property transferred to Reckson-Morris Operating Partnership, LLP (Reckson-Morris) in 2001.
- Building observed in this aerial was part of the Reckson-Morris redevelopment.

Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Site boundaries are approximate.

DATA SOURCES:
2012 Aerial: J5D12, J5D16, J6B4, K5C10, K5C13, K5C14, K5C9, K6A1, K6A2
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

2012 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	35

2012 – Site View

Observed Photograph Features

- A second building in southern area of site has been constructed since 2002. Now, these two large buildings appear to be the only buildings on the former site.
- Secondary parking lot constructed near southern building.

Site Development Notes

- Property subdivided into four lots with Givaudan retaining ownership of one lot, which contains the TCDD cell.
- The second building was constructed on the former site in 2003.

GIVAUDAN

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

October 26, 1983

RECEIVED
OCT 28 1983
PITNEY, HARDIN, KIPP & SZUCH

Mr. Raymond Basso
Hazardous Waste Site Branch
U.S. Environmental Protection Agency
Region II
26 Federal Plaza - Room 402
New York, New York 10278

RE: CERCLA 104/RCRA 3007 REQUEST FOR INFORMATION
Givaudan Corporation
Clifton, New Jersey

Dear Mr. Basso:

The purpose of this letter is to respond to the questions contained on Attachment I to the September 15, 1983 letter from Mr. William J. Librizzi, Director of your Office of Emergency and Remedial Response, to Mr. George Talarico of Givaudan Corporation ("Givaudan") received by Givaudan on September 19, 1983. On October 19, 1983, you granted Givaudan a one-week extension of time to respond.

The questions contained on Attachment I solicit information regarding the manufacturing or processing of "technical grade" 2,4,5-TCP and products made therefrom, as opposed to the manufacturing and processing of, or products made from, "pre-purified" 2,4,5-TCP, and Givaudan has responded to the questions on that basis. Information which would be responsive to the questions had they been intended to apply to "pre-purified" 2,4,5-TCP, however, has been provided by Givaudan to the New Jersey Department of Environmental Protection ("DEP") and is available to you should you wish to have it.

For example, Question 1 solicits information regarding formulations or pesticide derivatives of "technical grade" 2,4,5-TCP. One example given is hexachlorophene made from "technical grade" 2,4,5-TCP. Although Givaudan has manufactured hexachlorophene for many years, all the hexachlorophene manufactured and marketed by Givaudan has been produced from "pre-purified" 2,4,5-TCP; none of it has been produced using "technical grade" 2,4,5-

TCP. Accordingly, Givaudan has answered the questions only with respect to its limited production, in 1948 and 1949, of "technical grade" 2,4,5-TCP and not with respect to its production of hexachlorophene from "pre-purified" 2,4,5-TCP. EPA's proposed dioxin regulations, published on April 4, 1983, correctly recognized the distinction made by the questions on Attachment I between hexachlorophene manufactured using "technical grade" 2,4,5-TCP, in which 2,3,7,8-TCDD contamination might have occurred, on the one hand, and hexachlorophene made with "pre-purified" 2,4,5-TCP, using a reaction which occurs at rather low temperatures and at acid pH, in which 2,3,7,8-TCDD contamination is not expected to occur, on the other. 40 C.F.R. parts 261, 264, 265 and 775, 48 Fed. Reg. 14514 (April 4, 1983), note 7. <u>All hexachlorophene manufactured and marketed by Givaudan has been produced using only "pre-purified" 2,4,5-TCP utilizing a process such as is described in note 7 of the proposed regulations, so that no detectable levels of 2,3,7,8-TCDD contamination are expected to have occurred.</u> Analyses of Givaudan's finished hexachlorophene have verified the accuracy of that expectation.

The responses are numbered to correspond with the numbered questions contained on that Attachment I. Where indicated, some additional information is submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 <u>et seq</u>.:

1. Givaudan does not currently manufacture "technical grade" 2,4,5-TCP and has not done so for nearly 35 years, since 1949. In 1948 and 1949, Givaudan manufactured "technical grade" 2,4,5-TCP, which was distilled into "pre-purified" 2,4,5-TCP and used in hexachlorophene manufacture. 305,000 pounds of "pre-purified" 2,4,5-TCP was produced during that period from "technical grade" 2,4,5-TCP.

2. a) All "technical grade" 2,4,5-TCP Givaudan produced is believed to have been used to produce "pre-purified" 2,4,5-TCP.

b) Givaudan records show the purchase of a small amount of "technical grade" 2,4,5-TCP from Dow Chemical for experimental purposes only. Copies of all available 2,3,7,8-TCDD analyses have already been provided to and are on file with DEP in connection with their investigation of possible 2,3,7,8-TCDD contamination at Givaudan's facility.

3. Information responsive to Question 3 has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 <u>et seq.</u>

GIVAUDAN CORPORATION

4. a) Givaudan believes that "technical grade" 2,4,5-TCP was manufactured by the alkaline hydrolysis of 1,2,4,5 tetrachlorobenzene with caustic soda dissolved in ethylene glycol. After reaction, a batch was neutralized with muriatic acid and the sodium chloride precipitate was removed by filtration. The filtrate was diluted with water and the TCP was extracted with benzene. The benzene extract was washed with water and the benzene was removed by distillation. Ethylene glycol was recovered by fractionation and was reused in the process.

Further information responsive to Question 4 a) has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 _et seq._

4. b) No "technical grade" 2,4,5-TCP has been manufactured by Givaudan for nearly 35 years. In the relevant 1948 and 1949 time period, a vacuum still was used to purify 2,4,5-TCP. From our knowledge of TCP manufacturing operations, Givaudan believes that the following wastes in approximately the following quantity ranges were generated during the 2,4,5-TCP purification step:

1. Light Fractions 2-3 lb./lb.
2. Still Bottoms 0.2-0.3 lb./lb.

It is believed that none of these wastes were combined with wastes from other processes.

Further information responsive to Question 4 b) has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 _et seq._

5. Givaudan has no records from which specific decontamination procedures used with respect to "technical grade" 2,4,5-TCP manufacturing equipment can be determined; however, Givaudan's standard equipment cleaning and decontamination procedures, which are believed to have been followed with respect to equipment at one time used in the manufacture of "technical grade" 2,4,5-TCP, include thorough steam cleaning and solvent washing which Givaudan believes eliminated any possibility of 2,3,7,8-TCDD contamination. Because of the strong odor of "technical grade" 2,4,5-TCP, especially thorough cleaning and decontamination procedures are believed to have been used before reuse of equipment for manufacturing or processing of other chemical substances.

6. It is believed that the light fractions and still bottoms described in 4 b) above were drummed. Givaudan has no records describing the methods of collection, storage or disposal of such wastes, the names and addresses of haulers who might have hauled such wastes, or disposal site locations.

GIVAUDAN CORPORATION

Further information responsive to Question 6 has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 <u>et seq.</u>

7. a) There are no drums in storage containing light fractions or still bottoms generated in the manufacturing of "technical grade" 2,4,5-TCP. Givaudan has no records from which the total amount of such wastes generated during the history of its facility can be determined.

Further information responsive to Question 7(a) has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 <u>et seq.</u>

7. b) Givaudan has no records from which the total amount of wastes generated in the manufacture of "technical grade" 2,4,5-TCP can be determined, nor can Givaudan determine the dates of disposal, the amount disposed of on each occasion, the waste hauler or the disposal location. Whatever disposal activity that may have occurred, of course, took place nearly 35 years ago.

Further information responsive to Question 7(b) has been submitted on a separate sheet under a confidentiality claim pursuant to 40 C.F.R. 2.200 <u>et seq.</u>

8. Copies of all records of 2,3,7,8-TCDD testing with respect to the wastes identified in 4 and 5 have been provided by Givaudan to and are on file with DEP.

9. DEP is coordinating the investigation of possible 2,3,7,8-TCDD contamination at the Givaudan site. This investigation has involved the production by Givaudan to DEP of hundreds of analyses and large volumes of documents. DEP has all of this information, and Givaudan requests that, to the extent necessary, these documents be consulted at DEP, so that needless duplication of this burdensome document production can be avoided.

If there are any questions regarding this matter, please contact me at (201) 365-8521.

Very truly yours,

John Rankin

John Rankin, Vice President
Operations

Att.

March 12, 1971

Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Dear Mr. Blecker:

Four samples of 2,4,5 trichlorophenol and one sample of Hexachlorophene were received from Givuadan and analyzed by gas chromatography for 2,3,7,8 tetrachlorodibenzo-p-dioxin. The following results were obtained.

TCP	Dioxin
# 102901	< 0.10 ppm
# 102902	< 0.10 ppm
# 102903 (BRVT)	< 1.0 ppm
# 102904 (BRVST)	< 1.0 ppm
Hexachlorophene	
G-11 # 9326-70	< 0.10 ppm

In the analysis of Numbers 102903 and 102904, the sensitivity was limited by the tailing edge of an interferring peak, which could not be fully isolated from the dioxin peak. Sufficient separation was obtained to insure that the interferring peak was an unknown component, not 2,3,7,8 - dioxin.

Sincerely yours,

Bruce McCullough

Bruce McCullough
Chemist

BMcM/mw

HOOKER CHEMICAL CORPORATION
NIAGARA FALLS, N. Y.
FORM 1076A

October 27, 1970

L. E. Tufts
Manager of Quality Assurance

Dioxin Analysis on Material from Givaudan (Switzerland Samples)
Job 513 10-901-72-910 - A. A. Schlumberger

The following samples have been analyzed:

TCP	Result	G-11	Result
339.111	<.05 ppm	349.205	<.05 ppm
342.733	<.05 ppm	329.489	<.05 ppm
348.321	<.05 ppm	337.022	<.05 ppm

G-11	Result
177K6 8746	<.05 ppm
177K5 8796	<.05 ppm
1757K1 8704	<.05 ppm
1757K3 8694	<.05 ppm
178751 8787	<.05 ppm
1757K2 8691	<1* ppm

*Interfering peak after dioxin making sensitivity less than others.

Richard Vattimo
Richard Vattimo
Chemist
Works Laboratory

mar

cc: A. A. Schlumberger
Lab File

OCC00993541

OCCNJ0107914

RECEIVED
QUALITY ASSURANCE DEPARTMENT
MAR 2 9 1995
GIVAUDAN-ROURE CORPORATION
SPECIALTY DIVISION

State of New Jersey

Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

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FILE DIOXIN

Mr. Leonard A. Levy
Director Site Remediation
Givaudan-Roure Corporation
125 Delawanna Avenue
Clifton, New Jersey 07015-5034

Dear Mr. Levy:

Re: Relocation of Drums of Stored Soils
Givaudan-Roure Facility, Clifton

The purpose of this letter is to provide the New Jersey Department of Environmental Protection's (Department or DEP) approval of Givaudan's February 27, 1995, proposal to relocate 128 drums of excavated material (excavated from the contaminated non-process area) to a more secure location. In Givaudan's proposal these drums will be relocated into two metal shipping containers located approximately fifty feet from the present staging area. The containers will also have their floors lined with a geo fabric prior to emplacement of the drums which will then be covered with plastic and properly secured. The activity as described above is acceptable to the Department in order to maintain a more secure temporary staging area for this material.

However, the Department can not approve Givaudan's proposed sampling of the material prior to moving the drums into the shipping containers. Although the DEP will not prohibit Givaudan from collecting samples, it is unclear what benefit, either economic or environmental, could be realized from such an activity.

As the February 27, 1995, proposal states, three samples consisting of three composites from each lift of excavated material would be analyzed for 2,3,7,8 TCDD. This information, according to the letter, would be utilized as supporting data for future site remediation.

The DEP has evaluated the sampling proposal in light of the current Technical Requirements for Site Remediation (N.J.A.C. 7:26E) and the Department's May 1992 *Field Sampling Procedures Manual*, and has identified the following concerns associated with sampling of the drummed material:

1) The use of composite samples is usually restricted to waste classification analyses. In addition, the sampling frequency may not be adequate to provide any useful information for all 128 drums;

2) The contaminated process area was never sampled for any other parameters other than those byproducts associated with 2,3,7,8 TCDD. In as much as dioxin was the contaminant of concern driving the need for remediation, one can not conclude that other contaminants do not exist within these drummed containers;

Therefore, the Department does not understand the objective of this sampling episode. The DEP would recommend that these drummed soils be addressed consistent with the overall remediation for dioxin contaminated soils at the entire facility. By fragmenting this process, possibly repetitive and costly investigations might have to be initiated in lieu of one concise, focused effort to resolve the remediation of the dioxin contamination at the Givaudan facility. The DEP had attempted to illustrate the need for an inclusive remedial approach for all of the dioxin contaminated soils in its October 6, 1994, correspondence, but has yet to receive a reply on this issue.

The Department is hereby providing approval for the relocation of the 128 drums of material excavated from the contaminated process area on February 20, 1988. However, as previously stated, the Department does not recommend sampling of the 128 drums at this time.

Please do not hesitate to contact me at (609)633-0719 should you have any questions or additional matters to discuss regarding this approval letter or the Givaudan site.

Sincerely,

Thomas F. Quigley

Thomas F. Quigley, Case Manager
Bureau of State Case Management

c: J. Karpa, BSCM
A. Charles, BEERA
D. Clark, BGWPA
M. Eversman, ERM

RPCE\COAL\GIV23.TFQ

HOOKER CHEMICAL CORPORATION
NIAGARA FALLS, N. Y.

October 27, 1970

L. E. Tufts
Manager of Quality Assurance

Dioxin Analysis on Material from Givaudan (Switzerland Samples)
Job 513 10-901-72-910 - A. A. Schlumberger

The following samples have been analyzed:

TCP	Result	G-11	Result
339.111	<.05 ppm	349.205	<.05 ppm
342.733	<.05 ppm	329.489	<.05 ppm
348.321	<.05 ppm	337.022	<.05 ppm

G-11	Result
177K6 8746	<.05 ppm
177K5 8796	<.05 ppm
1757K1 8704	<.05 ppm
1757K3 8694	<.05 ppm
178751 8787	<.05 ppm
1757K2 8691	<1* ppm

*Interfering peak after dioxin making sensitivity less than others.

Richard Vattimo
Richard Vattimo
Chemist
Works Laboratory

mar

cc: A. A. Schlumberger
Lab File

July 24, 1970

L. E. Tufts
Manager of uality Assurance

The following samples of Hexachlorophene G-11 have been analyzed in the Works Laboratory for the presence of 2,3,7,8 tetrachlorodibenzo-p-dioxin for the Givaudan Corporation.

Code	Lot Numbers
18089A	7070, 7048
18089B	7022, 7016
18089C	7271, 7272, 7273, 7274
18089D	7545, 7537, 7353, 7568
18089E	7662, 7670, 7678, 7686
18089F	7781, 7789, 7797, 7805
	8666-70
	8857-70
	8739-70
	8743-70

No "Dioxin" was detected. All samples were prepared by Givaudan in the following manner:

1. 100g of Hexachlorophene were dissolved in 400 ml of water containing 40g of NaOH by heating to 45-50°C for 3-5 minutes and agitating over night at room temperature.

2. The alkaline G-11 solution was extracted with benzene three times using 200 ml of fresh benzene per extract.

3. The combined benzene extracts were washed with 200 ml of 10% aqueous NaOH followed by two successive washings with 200 ml of water.

4. The benzene solutions were concentrated on a rotary evaporator to approximately 25 ml for shipment to Hooker.

At Hooker the extracts were concentrated to 0.5 ml or as small a volume possible without forming undissolved solids. Five μl of this concentrate were then chromatographed, under the conditions listed below.

Chromatographic Conditions

Instrument	F and M 402 or equivalent
Column	2' glass packed with 2% Versamid 900 on 60-80 mesh chromosorb DMCS

OCC00993544

Detector	Flame Ionization
Hydrogen Flow	50 ml/min.
Air Flow	200 ml/min.
Helium Flow	50 ml/min
Injection Port Temperature	260°C
Detector Temperature	300°C
Column Temperature	200°C
Chart Speed	1/2" per min.
Sample Size	5 1

A standard, containing 0.2 ug/ul Dioxin in benzene, is injected and the chromatogram compared to that of the sample.

Gary Hahn
Chemist

mar

cc: Lab File

hooker

L E Tufts
Manager Quality Assurance

July 7, 1970

We have received and analyzed six additional concentrated benzene extracts of different lots of Givaudan Hexachlorophene G - 11. No trace of 2,3,7,8 - tetrachlorodibenzo - p - dioxin was found.

Results are given below:

Code	Lot Numbers	ppm "DIOXIN"
1089 A	7070, 7048	< .01
1089 B	7022, 7o16	<.01
1089 C	7271 - 7274	< .02
1089 D	7545,7537,7553,7568	< .01
1089 E	7662,7670,7678,7686	< .02
1089 F	7781,7789,7797,7805	< .02

All samples contained dissolved solids which prevented concentration to the desired 0.5 ml.. This is the cause of the variations in sensitivity reported above. Extraneous peaks appear on the chromatogram both before and after the "Dioxin".

Gary Hahn

Gary Hahn
Chemist

Lab File (2)

mw

OCC00993546

LT Hexachlorophene / [illegible]

June 8, 1970

L. E. Tufts
Manager, Quality Assurance

We have received and analyzed five concentrated benzene extracts of different lots of Givaudan Hexachlorophene G-11. No trace of 2,3,7,8 tetrachlorodibenzo-p-dioxin was found.

Results are given below:

Number	ppm "Dioxin
885770	<.03
833970	<.02
874370	<.02
871070	<.02
864470	<.01

All samples, with the exception of 864470, contained dissolved solids which prevented concentration to the desired 0.5 ml. This is the cause of the variations in sensitivit reported above.

It was attempted to react 871070 further with caustic and extract, this did not lower the solids content.

For the time being Givaudans extraction-reaction procedure appears satisfactory.

These results have been given to Mr. Conway by phone. V. Conway and M. Manowitz requested written confirmation of these results.

Gary Hahn
Chemist

mcr

OCC00993547

OCCNJ0107920

L E Tufts
Manager Quality Assurance

March 30, 1970

Subject: 2,3,7,8, Tetrachlorodibenzo-p-dioxin (TCDPD) in the Trichlorophenol Process.

Various streams in the Trichlorophenol process have been analyzed for 2,3,7,8 tetrachlorodibenzo-p-dioxin by Gas Liquid Chromatography

Listed below are the samples analyzed and the concentration of TCDPD found or the lower limit of detection.

Sample	ppm TCDPD
Extractor water feed 3/18/70	< 0.01
Extractor Feed 3/18/70	3.0
Boiler Crude Glycol 3/18/70	< 0.01
Crude Charged to Still 3/19/70	12.0
Oliver Salt 3/14/70 3/18/70	< 0.04
Technical Grade Flake Lot 3	< 0.05
TCP Still Residue 3/25/70	230
Glycol Still Residue 3/25/70	< 0.03
Extractor Crude 3/25/70	< 1.0
Reactor Discharge Tank 3/25/70	< 0.10
Low Boil Fraction 3/25/70	< .03
Intermediate Fraction 3/25/70	< .03

Gary E Hahn
Gary E Hahn

cc: J M O'Leary, A A Schlumberger, W E Fitzgerald, J B Harrison, J J Wilkingeld, L E Tufts, W E Leroux, F L Echelberger, Gary Hahn,

Lab file (2)

mw

0CC00993548

F E

L. E. Tufts
Manager, Quality Assurance

March 9, 1970

Subject: The Determination of 2,3,7,8 Tetrachlorodibenzo-p-dioxin, (TCDPD), in Flake Trichlorophenol by Gas Liquid Chromotography.

A preliminary investigation to determine the amount of TCDPD in Hooker Flake Trichlorophenol has been carried out in the Works Lab.

Results: The following lots were run:

Lot 20	1/22/70
" 65	3/02/70
" 4	1/07/70

No TCDPD was found in any of the above lots.

Equal weights of the following lots, selected at random, were composited and analyzed.

Sample No.1	Sample No.2	Sample No.3
Lot 42 2/08/70	Lot 61 2/24/70	Lot 50 2/18/70
" 25 1/26/70	" 64 3/02/70	" 8 1/14/70
" 30 1/31/70	" 26 1/02/70	" 38 2/06/70
" 19 1/20/70	" 37 2/05/70	" 55 2/21/70
" 36 2/04/70	" 21 1/23/70	" 14 1/17/70

No TCDPD was found.

The method used has a lower detection limit of 0.2 ppm. Hence, lots 20, 65 and 4 all contained less than 0.2 ppm of TCDPD. None of the individual lots making up the composits could have contained more than 1 ppm of TCDPD.

Gary E Hahn

Gary E Hahn

mc

OCC00993549

Confidential

OCCNJ0107922

EXHIBIT VI

Process Description
2,4,5-Trichlorophenol (TCP)

TCP was produced in a semi-continuous processing facility located in Building D-7. In the initial step 1,2,4,5-tetrachlorobenzene and sodium glycolate dissolved in excess ethylene glycol were reacted batchwise, under essentially anhydrous conditions, in agitated, jacketed vessels to form sodium trichlorophenate. The temperatures of this reaction step was generally between 165 and 175° while the pressure was less than 50 psig. Diethylene and triethylene glycols, as well as dioxane*, were also formed during this reaction.

The next step was the batch neutralization of the reaction product in a separate vessel with anhydrous hydrogen chloride in order to form "crude" TCP, solid NaCl and glycols. The pH at the end of this step was in the range of 3 to 4, while the temperature was about 70°C.

The solid NaCl was removed in a continuous filtration step and the liquor then fed to continuous counter-current extraction equipment where the "crude" TCP was contacted with hot water (about 70°C) in order to remove the various glycols present as well as the remaining NaCl.

The extracted TCP was next separated into four fractions by the use of batch fractional distillation under vacuum. These fractions were:

1. Low Boil - recycled back to the extraction step.

2. Intermediate - recycled to next distillation batch.

3. Product - removed at 160-180°C and 30-40 mm Hg, then flaked and packaged in drums for shipment.

4. Residue - drummed for residue disposal.

The water from the extraction step was separated by continuous distillation from the glycols and recycled back to the extraction step. The remaining glycol rich stream was then sent to a batch vacuum recovery still where the ethylene glycol fraction was recovered and the high boiling fraction (water soluble polyglycols and NaCl) was sent to the sanitary sewer.

Recovered glycol and make-up ethylene glycol was next reacted with anhydrous NaOH to form sodium glycolates for feed to the first step and the cycle repeated.

All raw materials, with the exception of ethylene glycol, were produced at the Niagara Plant.

*Not to be confused with "dioxins".

(Form 53 Parts) DUPLICATE
PT. #20908253

HOWE RICHARDSON SCALE COMPANY
EXECUTIVE OFFICES – CLIFTON, NEW JERSEY

No. ____

From ____ To ____

Load of Waste

56 620 Gross

Driver {on/off ____

23 350 Tare

Fees ____ Date ____ 19__

____ Net

____ Weigher.

PRINTED IN U.S.A.

~~estimated~~ 27

63620
26350
−37270

Form VHW-001 (10/80)

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

HAZARDOUS WASTE MANIFEST

Please TYPE all information.

PART A: GENERATOR'S COPY DOCUMENT NO: NJ 0065423

GENERATOR NAME: GIVAUDAN CORPORATION
PHONE (INCLUDE AREA CODE): (201) 365-8483
EPA ID NO.: NJD002156354

ADDRESS (STREET - CITY - STATE - ZIP CODE): 125 Delawanna Avenue, Clifton, New Jersey 07014

TRANSPORTER NO. 1: Environmental Transport
PHONE (INCLUDE AREA CODE): (201) 347-8200
EPA ID NO.: NJD000692061

ADDRESS (STREET - CITY - STATE - ZIP CODE): P.O. Box 296, Flanders, New Jersey 07836

TRANSPORTER NO. 2:
PHONE (INCLUDE AREA CODE):
EPA ID NO.:

ADDRESS (STREET - CITY - STATE - ZIP CODE):

TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY: CECOS INTERNATIONAL INC
PHONE (INCLUDE AREA CODE): (716) 282-2676
EPA ID NO.: NYD080336241

SITE ADDRESS (STREET - CITY - STATE - ZIP CODE): 56th Street & Pine Avenue, Niagara Falls, N. York 14302

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE
THIS FORM IS NO. ____ OF A TOTAL OF ____. THE FIRST MANIFEST DOCUMENT NO. IS NJ→

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS NO.	CONTAINERS TYPE	EPA HAZ CODE	EPA WASTE TYPE
*1. WASTE POLYCHLORINATED BIPHEYL	ORM E	2315	2	50	3	01	01	T	[illegible]
2. WASTE TRICHLOROPHENOL	ORM A	NA 2020	2	3297	3	06	01	T	[illegible]
3. NONE (HEXACHLOROPHENE)	NONE	2875	2	6558	3	28	01	T	4132
4.									
5.									
*PCB content	1% of	Total	Weight						

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)
48 steel drums of solid nonhazardous still bottom residues netting 20,965 lbs.

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked and labelled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the State. The wastes described above were consigned to the Transporter named. The Treatment, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE - ALSO PRINT SIGNATURE: Charles A. Lord
TITLE: Mgr. Mft. Hdg & Distribution
DATE SHIPPED: 02 04 83 (MO. DAY YR.)
EXPECTED ARRIVAL DATE: 02 07 83 (MO. DAY YR.)

TRANSPORTER NO. 1 SIGNATURE AND CERTIFICATION OF RECEIPT OF SHIPMENT - ALSO PRINT SIGNATURE: HUBER
TRANSPORTER NO. 1 SWA REGISTRATION NO.: NJSWA57107A
DATE RECEIVED: 02 04 83 (MO. DAY YR.)

TEAR AT THIS PERFORATION

TEAR AT THIS PERFORATION

PART B: GENERATOR'S COPY GIVAUDAN

GENERATOR EPA ID NO. NJD002156354

TRANSPORTER NO. 1 SIGNATURE AND CERTIFICATION OF DELIVERY AND NON-TAMPERING WITH SHIPMENT-ALSO PRINT SIGNATURE W04 50471 PC 176 VARIOUS

DATE DELIVERED 02 08 93 (MO. DAY YR.)

TRANSPORTER NO. 2 SIGNATURE AND CERTIFICATION OF RECEIPT OF SHIPMENT-ALSO PRINT SIGNATURE

TRANSPORTER NO. 2 SWA REGISTRATION NO.

DATE RECEIVED (MO. DAY YR.)

TRANSPORTER NO. 2 SIGNATURE AND CERTIFICATION OF DELIVERY AND NON-TAMPERING WITH SHIPMENT-ALSO PRINT SIGNATURE

DATE DELIVERED (MO. DAY YR.)

TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR AND DISPOSITION OF REJECTED MATERIALS

HANDLING METHOD

1 D81	4
2 D81	5
3 D81	6

TSD FACILITY EPA ID NO. NJD050336241

TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE & CERTIFICATION OF RECEIPT OF SHIPMENT - ALSO PRINT SIGNATURE Bock

TITLE WEIGHMASTER

DATE RECEIVED 02 08 93 (MO. DAY YR.)

In case of emergency or spill immediately call the State the Emergency occurred in and the N.J. Dept. of Environmental Protection
(609) 292-5560 (Day) (609) 292-7172 (Night)

DOCUMENT NO. NJ 0065423

STRAIGHT BILL OF LADING — ORIGINAL — NOT NEGOTIABLE — SHORT FORM

SHIPPER'S NO. W. O. 50471

Approved E.T. Group Invoice

CARRIER: Environmental Transport Group Inc

DATE 2 / 4 / 83

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Original Bill of Lading.

GIVAUDAN CORPORATION

At CLIFTON, N.J. (UNLESS BOX X'D BELOW)

☐ BELVIDERE, N.J.

☐

[illegible]

CARRIER'S NO. 2/9/83 Approved CECOS Invoice 50471

CONSIGNED TO AND DESTINATION

CECOS INTERNATIONAL
56th Street & Pine Avenue
Niagara Falls, N. York
14302

ROUTE

DELIVERING CARRIER

CAR OR VEHICLE INITIALS & NO.

†CHARGES ARE TO BE:

☒ **PREPAID** (SHIPPER'S NUMBER MUST APPEAR ON FREIGHT BILL)

☐ **COLLECT**

CUSTOMER ORDER NO. To be delivered 7:30 on Feb. 7, 1983

NO. PKGS.	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS		*WEIGHT (SUB. TO COR.)	CLASS OR RATE	CK. COL.
*	(48 – 176A)(0 – 176D)(		0 – 176H)		
1	STEEL DRUMS	WASTE POLYCHLORINATED BIPHENYL ORM E		LTL	
	CARTONS	~~FLAMMABLE LIQUID, N.O.S. UN 1993~~ (NMFC ITEM 60000, 72910, 144900 SUB. 1)		70 TL	
	PAILS	UN 2315 RQ 10/4.54		40	
18	STEEL DRUMS	WASTE CHEMICALS N.O.I.	33270	LTL	
	FIBRE DRUMS	(NMFC ITEM 60000) *		70	
	PAILS	— — —			
	CARTONS	ESSENTIAL OILS N.O.I. (NMFC ITEM 144900 SUB. 1)		TL 40	
28	STEEL DRUMS	WASTE HEXACHLOROPHENE ~~FLAVORING COMPOUNDS N.O.I.~~		LTL	
	FIBRE DRUMS	~~(NMFC ITEM 72910)~~ UN2875 — — —		70	
	PAILS	~~IMITATION FLAVORS N.O.I.~~		TL	
	CARTONS	(NMFC ITEM ~~79810)~~ 60000)		40	
	STEEL DRUMS			LTL	
	CARTONS	INDUSTRIAL PROCESS WATER TREATING COMPOUNDS (LIQUID) N.O.I. (NMFC ITEM 50227 SUB. 1)		60 TL	
	PAILS			35	
6	STEELDRUMS WASTE TRICHLOROPHENOL				
	ORM A NA2020 RQ 10/4.54				

NOTE— WHERE THERE IS A RATE DEPENDENT ON VALUE, THE AGREED OR DECLARED VALUE OF THE PROPERTY IS HEREBY SPECIFICALLY STATED BY THE SHIPPER TO BE NOT EXCEEDING:

$1.10 PER POUND

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement. The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Givaudan Corporation

Received $______ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier.

per ______ (The signature here acknowledges only the amount prepaid.)

Charges advanced $______

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

†Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Interstate Commerce Commission.

†This is to certify that the above named materials are properly classified, described, packaged marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation and the EPA.

†The fibre drums, drums, pails, cartons or carboys used for this shipment conform to the specifications set forth in maker's certificate thereon, and all other requirements of the Consolidated Freight Classification.

† PLACARDS PROVIDED BY GIVAUDAN ☐ CARRIER ☐

GIVAUDAN CORPORATION, SHIPPER EPA-NJD 002156354

Per Charles A. Ford

PERMANENT POST-OFFICE ADDRESS OF SHIPPER: 7014 Phone: (201) 546-8000

(FULL NAME OF CARRIER) Agent, Per 02-04-83 (FULL SIGNATURE OF DRIVER)

Giv. P.O. # 30819

THIS MEMORANDUM is an acknowledgment that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein and is intended solely for filing or record.

SHIPPER'S NO. W.O. 50471

Approved E.T. Ship Invoice

CARRIER'S NO. 2/9/83

Approved CECOS Invoice 50471

CARRIER: Environmental Transport Group Inc

DATE: 2/4/83

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Original Bill of Lading,

From **GIVAUDAN CORPORATION**

At CLIFTON, N.J. (UNLESS BOX X'D BELOW)

☐ BELVIDERE, N.J.

☐

[illegible]

CONSIGNED TO AND DESTINATION

CECOS INTERNATIONAL
56th Street & Pine Avenue
Niagara Falls, N. York
14302

ROUTE

DELIVERING CARRIER

CAR OR VEHICLE INITIALS & NO.

†CHARGES ARE TO BE:

☒ PREPAID (SHIPPER'S NUMBER MUST APPEAR ON FREIGHT BILL)

☐ COLLECT

CUSTOMER ORDER NO. To be delivered 7:30 on Feb. 7, 1983

NO. PKGS.	KIND OF PACKAGE	DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	*WEIGHT (SUB. TO COR.)	CLASS OR RATE	CK. COL.
*	(48-176A)(0-176D)(		0 -	176 H)	
1	STEEL DRUMS / CARTONS / PAILS	WASTE POLYCHLORINATED BIPHENYL ORM E ~~FLAMMABLE LIQUID N.O.S. UN 1993~~ (NMFC ITEM 60000, 72910, 144900 SUB. 1) UN 2315 RQ 10/4.54		LTL 70 TL 40	
48	STEEL DRUMS / FIBRE DRUMS / PAILS / CARTONS	WASTE CHEMICALS N.O.I. (NMFC ITEM 60000) * — ESSENTIAL OILS N.O.I. (NMFC ITEM 144900 SUB. 1)	33270	LTL 70 TL 40	
28	STEEL DRUMS / FIBRE DRUMS / PAILS / CARTONS	WASTE HEXACHLOROPHENE ~~FLAVORING COMPOUNDS N.O.I.~~ ~~(NMFC ITEM 72910)~~ UN2875 — ~~IMITATION FLAVORS N.O.I.~~ (NMFC ITEM ~~72910~~ 60000)		LTL 70 TL 40	
	STEEL DRUMS / CARTONS / PAILS	INDUSTRIAL PROCESS WATER TREATING COMPOUNDS (LIQUID) N.O.I. (NMFC ITEM 50227 SUB. 1)		LTL 60 TL 35	
6	STEEL DRUMS	WASTE TRICHLOROPHENOL ORM A NA2020 RQ 10/4.54			

NOTE— WHERE THERE IS A RATE DEPENDENT ON VALUE, THE AGREED OR DECLARED VALUE OF THE PROPERTY IS HEREBY SPECIFICALLY STATED BY THE SHIPPER TO BE NOT EXCEEDING:

$1.10 PER POUND

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement. The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Givaudan Corporation

Received $ ______ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier.

per ______ (The signature here acknowledges only the amount prepaid.)

Charges advanced $ ______

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

†Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Interstate Commerce Commission.

†This is to certify that the above-named materials are properly classified, described, packaged marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation and the EPA.

†The fibre drums, drums, pails, cartons or carboys used for this shipment conform to the specifications set forth in maker's certificate thereon, and all other requirements of the Consolidated Freight Classification.

† PLACARDS PROVIDED BY
GIVAUDAN ☐
CARRIER ☐

GIVAUDAN CORPORATION, SHIPPER EPA-NJD 002156354

Per [signature]

PERMANENT POST-OFFICE ADDRESS OF SHIPPER:
100 Delawanna Avenue, Clifton, New Jersey 07014 Phone: (201) 546-8000

[signature] 02-04-83

(FULL NAME OF CARRIER) Agent, Per (FULL SIGNATURE OF DRIVER)

3

Scale Ticket # ____________

Product Codes

TRUCK DEMURRAGE & SPOTTING REPORT

W.O. # 50471	Customer & Location Gnadaun Clifton	Hauler E.T.G.I.	2-4-83 Date

Loading Time 2-4-83

Scheduled Time 8:00

Arrival 8:00

Departure 9:30

Reason for Delay (To be Completed)

Hauler Signature

Authorized Signature (Generator)

Pump & Hose ☐ Check if applicable

Plastic Liner ☐

Unloading Time 2-7-83

Scheduled Time 7:30

Arrival ____________

Lab-In ____________

Lab-Out ____________

Departure ____________

Reason for Delay (To be Completed by CECOS)

Hauler Signature

Authorized Signature (CECOS Personnel)

Service Type

Dump Trailer ☐

Tandem ☐

Box Van ☒

Tanker ☐

Roll Off ☐

Lugger ☐

Vac Truck ☐

Vac Trailer ☐

Portal to Portal for Vac Service (# of Hours) ____________

Charges to be Billed

Base Price $ ____________

Detention (Loading) ____________

(Unloading) ____________

Spotting ____________

Other ____________

GENERATOR

ENVIRONMENTAL TRANSPORT GROUP, INC. ☒ **DEVCON INC.** ☐

P.O. BOX 296, FLANDERS, N.J. 07836

OFFICE/ 584-2320 — WAREHOUSE/ 347-9730

G

MANIFEST #________ ☐ A ☐ C

TRUCK # 204 TR # 112

DRIVER Bob Huber

PICK UP: Fri 2-4-83 / 8:00 / 50471
DATE / TIME / W.O. #

NAME: Givaudan Corp.

ADDRESS: 100 Delaware Ave
Clifton, N.J.

CODE 176 NA
RAA

Charles LORD

TIME IN: ______ TIME OUT: ______ TOTAL TIME: ______ $ ______

DELAY EXPLANATION: ______

[illegible]
SIGNATURE: (PICK UP)

INTERMEDIATE: ______
NAME ADDRESS

TIME IN: ______ TIME OUT: ______ TOTAL TIME: ______ $ ______

DELAY EXPLANATION: ______

SIGNATURE: (INTERMEDIATE)

UNLOAD: Mon 2-7-83 / 7:30
DATE TIME

NIAGARA ☒ OHIO ☐ OTHER ______ $ ______

TIME IN: ______ TIME OUT: ______ TOTAL TIME: ______ $ ______

DELAY EXPLANATION: ______

SIGNATURE: (UNLOADING SITE)

$ ______

AVOID VERBAL INSTRUCTIONS

To Mr. - Miss ______________________ Date ____________

____

Subject ______________________________________

1- DR - Poly Biphenyls 176 M- 100-50-50 LBS

6-DRS Trichlorophenol - 176R-

687 - 50 - 637
680 - 50 630
594 - 50 544
684 - 50 634
489 - 50 439
463 - 50 413

3297-LBS Net

28- Hexachlorophene - 176 AA

164-	247	203	203
198	205	225	240
249	207	210	212
472	279	200	210
206	202	217	250
217	283	230	259
207	292	274	
		197	

6,558 -LBS Net

From ______________________________________

from the desk of
JOHN T. ANGIOLINI

CECOS CONTACTED —

when you send out (Super Rush)
drum of 6-11 send copy
of manifest to

Donna Dawson
N.J. DEP
1259 RT 46
Parsippany, N.J.

as per your talks to Turetsky

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 365-8483
Cable: Givaudanco, Clifton
Telex: 138901

February 7, 1983

Ms. Donna Dauson
N.J. DEP
1259 Route 46
Parsippany, N. J. 07054

Dear Ms. Dauson:

Per your request to our Mr. William Turetsky attached is a copy of the Hazardous Waste Manifest covering the proper disposal of the drum of Hexachlorophene which someone improperly dumped on the Punia Construction Company property in Franklin Township, New Jersey.

You will note that in addition to this drum, Givaudan is also disposing of other drums of Hexachlorphene. Most of this is filter media containing a small percentage of Hexachlorphene and the balance some off specification material which cannot be converted into Givaudan quality product.

Sincerely yours,

GIVAUDAN CORPORATION

Charles A. Lord
Manager of Materials Handling & Distribution

:jmb

Encl.

cc: W. Turetsky

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Please TYPE all information.

HAZARDOUS WASTE MANIFEST

PART A: SEND TO DISPOSER'S STATE

DOCUMENT NO. NJ 0065423

GENERATOR NAME	PHONE (INCLUDE AREA CODE)	EPA ID NO.
GIVAUDAN CORPORATION	(201) 365-8483	NJD002156354
ADDRESS (STREET - CITY - STATE - ZIP CODE): 125 Delawanna Avenue, Clifton, New Jersey 07014		
TRANSPORTER NO. 1: Environmental Transport	(201) 347-8200	NJD000692061
ADDRESS (STREET - CITY - STATE - ZIP CODE): P.O. Box 296, Flanders, New Jersey 07836		
TRANSPORTER NO. 2		
ADDRESS (STREET - CITY - STATE - ZIP CODE)		
TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY: CECOS INTERNATIONAL INC	(716) 282-2676	NYD080336241
SITE ADDRESS (STREET - CITY - STATE - ZIP CODE): 56th Street & Pine Avenue, Niagara Falls, N.York 14302		

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE
THIS FORM IS NO. ____ OF A TOTAL OF ____. THE FIRST MANIFEST DOCUMENT NO. IS NJ→

	PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS NO.	CONTAINERS TYPE	EPA HAZ CODE	EPA WASTE TYPE
1.	WASTE POLYCHLORINATED BIPHENYL*	ORM E	2315	2	50	3	01	01	T	B006
2.	WASTE TRICHLOROPHENOL	ORM A	NA 2020	2	3297	3	06	01	T	U230
3.	None (HEXACHLOROPHENE)	None	2875	2	6558	3	28	01	T	U132
4.										
5.										
	*PCB content	1% of	Total		weight					

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)
48 steel drums of solid nonhazardous still bottom residues netting 20,965 lbs.

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked and labelled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the State. The wastes described above were consigned to the Transporter named. The Treatment, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE - ALSO PRINT SIGNATURE	TITLE	DATE SHIPPED	EXPECTED ARRIVAL DATE
Charles A. Lord	Mgr. Mtl. Hdlg & Distribution	02 04 83 (MO. DAY YR.)	02 07 83 (MO. DAY YR.)

TRANSPORTER NO. 1 SIGNATURE AND CERTIFICATION OF RECEIPT OF SHIPMENT - ALSO PRINT SIGNATURE	TRANSPORTER NO. 1 SWA REGISTRATION NO.	DATE RECEIVED
[signature] Huber	NJSWA5710744	02 04 83 (MO. DAY YR.)

TO BE ... BY GENERATOR

TEAR AT THIS PERFORATI...

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

February 8, 1983

Mr. Craig Frost
CECOS International Inc.
Niagara Falls Blvd. & Walmore Road
Niagara Falls, New York

Dear Mr. Frost:

The shipment of 28 drums of Hexachlorophene against N. J. Manifest #65423 consisted of:

2 drums of 95% or greater Hexachlorophene (CECOS 176AA)

26 drums of Filter Cake from Hexachlorophene Manufacture (CECOS 176D). The Hexachlorophene content in the filter cake is less than 10%.

For simplicity, we incorrectly grouped both together. We regret any inconvenience this may have caused you. In the future, we will send the filter cake under the existing 176D code.

Very truly yours,

GIVAUDAN CORPORATION

Charles A. Lord

Charles A. Lord, Manager
Materials Handling & Distribution

CAL/rd

P.S. On the manifest please change line 3 to read net quantity of 100 pounds and number of containers to 2 and under Special Handling Instructions add 26 steel drums of non-regulated filter media netting 6,458 pounds.

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) ~~XXX-XXXX~~ 365-8483
Cable: Givaudanco, Clifton
Telex: 138901

February 8, 1983

N.J. Dept. of Environmental Protection
Solid Waste Administration
P.O. Box CN-027
Trenton, N. J. 08625

Attn: Manifest Section

Gentlemen:

Please make the following corrections to N.J. Manifest #65423 dated February 2, 1983:

1. Change line 3 to read net quantity of 100 pounds and number of containers to 2

2. Add under Special Handling Instructions 26 steel drums of non-regulated filter media netting 6,458 pounds.

Thank you.

Sincerely,

GIVAUDAN CORPORATION

Charles A. Lord

Charles A. Lord
Manager of Materials Handling & Distribution

CAL:jmb

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) ~~XXXXXX~~ 365-8483
Cable: Givaudanco, Clifton
Telex: 138901

February 8, 1983

New York State - DEC
P.O. Box 15628
Albany, N.Y. 12212

Gentlemen:

Please make the following corrections to N.J. Manifest #65423 dated February 2, 1983:

1. Change line 3 to read net quantity of 100 pounds and number of containers to 2

2. Add under Special Handling Instructions 26 steel drums of non-regulated filter media netting 6,458 pounds.

Thank you.

Sincerely,

GIVAUDAN CORPORATION

Charles A. Lord

Charles A. Lord
Manager of Materials Handling & Distribution

CAL:jmb

OFF—SPECIFICATION or IRREGULAR SHIPMENT

Customer / Location	Date	Report No.
Givaudan	2-7-83	
	Customer No. 176	**Work Order** 50471

Arrival Date 2-7-83

Arrival Time AM / PM

- ☐ Unscheduled
- ☐ Late ________ Hrs.
- ☐ Early ________ Hrs.

Release Time

Departure Time

A. Extra Cost Summary

- ☐ Detention
- ☐ Spotting, Dead Head Storage

Hauler ETG

- ☐ DTD No.
- ☐ Sampling
- ☐ Lab
- ☐ Labor
- ☐ Machine
- ☐ Purchased Material
- ☐ Safety Equipment
- ☐ Cleanup
- ☐ Process Modification
- ☐ Maintenance
- ☐ Supv. / Admin.
- ☐ ________
- ☐ ________
- ☐ ________

B. DOCUMENTATION

- ☐ Bill of Lading: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Other
- ☐ Work Order Numbers: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Other
- ☐ Manifest: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Other
- ☐ Packing List or Grid Chart: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Other

C. Delay Responsibility

- ☐ Contacting Customer ☐ Awaiting Customer Response ☐ Hauler's ☐ Customer's
- ☐ NEWCO's ☐ Other ________

D. Containerization

- ☐ Code Markings: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Invalid ☐ Other
- ☐ Labeling: ☐ Missing ☐ Incorrect ☐ Illegible ☐ Other
- ☐ Incompatible Materials on same load.
- ☐ Steel, 30-55 gal. drums: ☐ Leaking ☐ Damaged ☐ Loose or Missing Covers or Bungs ☐ Bulged ☐ Unopenable ☐ On Pallets ☐ Other
- ☐ Other Type: ☐ Fiber Drums ☐ Cartons / Cases ☐ Crates ☐ Bags ☐ Small Drums ☐ On Pallets ☐ No Pallets ☐ Other
- Condition: ☐ Leaking ☐ Damaged ☐ Disarrayed ☐ Other
- ☐ Corrective Action: ☐ Special Handling ☐ Repackaging ☐ Clean Vehicle ☐ Site Cleanup ☐ Special Equipment ☐ Physical Property Damage Repair ☐ Personal Injury ☐ Label or Relabel ☐ Other

E. Quality Control

- ☒ Material did not meet WPR description. Waste Prod. Code No. 176-AA
- Quantity Off Spec. 28 Waste Material ________
- ☐ Physical State: ☐ Solid ☐ Liquid ☐ Semi-Solid ☐ Excess Free Liquid
- ☐ Specific Gravity ________ ☐ TOC ________ ☐ ____ % ________
- ☐ Viscosity ________ ☐ BTU ________ ☐ ____ % ________
- ☐ Flash Point ________ ☐ Org Cl/S ________ ☐ ____ % ________
- ☐ pH ________ ☐ % Ash ________ ☐ ____ % ________
- ☐ Layering: ☐ Bi ☐ Multi
- ☐ Solids: ☐ ____ % Total ☐ ____ % SS ☐ ____ % Diss.
- ☐ Undue Hazard: ☐ ________

Amplification The WPR for 176-AA was approved for 2 drums one time by the state. Truck arrived with 28 drs of 176-AA. Tried to get approval from state to handle all 28 could not. Jack R. called at 4:30 stated that 26 drums should have been 176-D. I told them that I needed written certification. Could not get on 2-7-83 truck held over. On 2-8-83 Jack R. called again he had letter in hand truck released after manifest corrected.

delay

Review By C [signature]

Lab | Operations | Sales | Finance

Action Taken:

- ☐ Letter
- ☐ Assess Costs $ ________
- ☐ Invoice No. ________
- ☐ Inv. Date ________

Water Treatment / White—Accounting / Yellow—Lab / Pink—Sales Department / Gold

CECOS INTERNATIONAL INC.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS

CECOS INT'L OF N.H., INC.
P.O. BOX 687
KEENE, N.H. 03431

INVOICE NUMBER: 50471

INVOICE TO:
0176-3
GIVAUDAN CORPORATION
125 DELAWANNA AVENUE
CLIFTON, NJ 07014

INVOICE DUE DATE 2/25/83

SHIP FROM:
0176-3
GIVAUDAN CORPORATION
125 DELAWANNA AVENUE
CLIFTON, NJ 07014

INVOICE DATE: 2/15/83 SALESMAN: E. BOCCUZZI ORDER DATE: 2/02/83 YOUR ORDER NUMBER:

DATE RECEIVED: 2/07/83 VIA: CUSTOMER F.O.B.: PRE-PAID

PROD. CODE	DESCRIPTION	NET QUANTITY	UNIT PRICE	AMOUNT
0176-A	STILL BOTTOM RESIDUE #1	48 DR 55	42.00	2,016.00
0176-AA	HEXACHLOROPHENE	2 DR 55	65.00	130.00
0176-D	FILTER CAKE FROM HEXACLOROPH	26 DR 55	42.00	1,092.00
0176-M	SOLID WASTE	1 DR 55	60.00	60.00
0176-F	WASTE TRICHLOROPHENOL	6 DR 55	60.00	360.00
			charge	062400
				O.K. C.d. Fred
			MINI FUND	20.64

TOTAL AMOUNT DUE 3,678.64

TERMS NET 10 DAYS

Past due balance will be accessed 1½% per month.

CERTIFICATE OF DISPOSAL: THIS IS TO CERTIFY THAT THE WASTE MATERIALS HEREIN INVOICED HAVE BEEN PROPERLY DISPOSED OF IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS.

ORIGINAL INVOICE

G 44435

CECOS INTERNATIONAL, INC.
56th ST., NIAGARA FALLS, N.Y. 14304
Phone: 731-3281
MAILING ADDRESS: 2321 Kenmore Ave., Buffalo, N.Y. 14207

GIWAODAN

52471

Trucker ETC #204
Truck # 1 Disposal Area:

Driver On ☐ ☐ Off Time Date

Gross	65100 LB	FEB 7 7 32 AM '83	
	36780 LB	FEB 7 4 57 PM '83	
Tare	29250		
Net	37870		

☐ CASH
☐ CHARGE
☐ WEIGHT ONLY

Commodity—Price—Spec. Info.
Weigher

Driver's Signature

OFFICE

G 53499

CECOS INTERNATIONAL, INC.
56th ST., NIAGARA FALLS, N.Y. 14304
Phone: 731-3281
MAILING ADDRESS: 2321 Kenmore Ave., Buffalo, N.Y. 14207

GIVAUDAN

504 71

Trucker F.T.G #204

Truck # Disposal Area:

Driver On ☐ ☐ Off Time Date

Gross	36740 LB	FEB 8 7 32 AM '83	
Tare	~~29280 LB~~	FEB 8 10 38 AM '83	
	6460		
Net			

☐ CASH
☐ CHARGE
☐ WEIGHT ONLY

Commodity—Price—Spec. Info.

Weigher

Driver's Signature

OFFICE

ENVIRONMENTAL TRANSPORT GROUP, INC.
P.O. Box 296, Flanders, New Jersey 07836

Office - 584 - 2320 - Garage - 347 - 9730

February 9, 1983

Givaudan Corp.
100 Delawanna Avenue
Clifton, New Jersey 07014

Attn: Mr. C. Lord
Accounts Payable

Pick up:	2/4/83 WO#50471,	Givaudan Corp. Clifton, N.J.	
Unload:	2/8/83	CECOS/Niagara	900.00
Layover:	2/7/83	Niagara	350.00
February 7, 1983		7½hrs. WT	225.00
February 8, 1983		3hrs. WT-	90.00

Total....................$1,565.00

Fright Charges on
Waste Chemicals
OK
C. L. Lord
2/22/83

NEW YORK STATE
MINIFUND WORKSHEET

DATE 2-8-83

GENERATOR: G.vaudas CODE: 176

W.O. # 50471 E.P.A. ID. # NJD 002 156354 MANIFEST #

DRUMS ON SHIPMENT TOTAL WEIGHT AVG./DRUM

MANIFEST INFORMATION

TYPE OF WASTE (CIRCLE ONE)		NUMBER OF DRUMS	TOTAL * WEIGHT	DISPOSAL CODE	D-81	T-29	OTHER
H	NH	1	50	DA	50		
H	NH	6	3297	DA	3297		
H	NH	2	100	DA	100		
H	NH						
H	NH						
H	NH						
H	NH						
H	NH						
H	NH						
H	NH						
TOTAL WEIGHT* HAZARDOUS WASTE - LANDFILLED					3447		
TOTAL WEIGHT* HAZARDOUS WASTE - TREATED							

COMMENTS -

SIGNED -

G 53499

GIV/UDAN

CECOS INTERNATIONAL, INC.
56th ST., NIAGARA FALLS, N.Y. 14304
Phone: 731-3281
MAILING ADDRESS: 2321 Kenmore Ave., Buffalo, N.Y. 14207

52471

Trucker
Truck # Disposal Area:

Driver On ☐ ☐ Off Time Date

===36740LB FEB 8 7 32 AM '83

Gross

===29200LB FEB 8 10 33 AM '83

Tare

Net

☐ CASH
☐ CHARGE
☐ WEIGHT ONLY

Commodity—Price—Spec. Info.

Weigher

Driver's Signature

CUSTOMER COPY

G 44435

CECOS INTERNATIONAL, INC.
56th ST., NIAGARA FALLS, N.Y. 14304
Phone: 731-3281
MAILING ADDRESS: 2321 Kenmore Ave., Buffalo, N.Y. 14207

UNKNOWN

5471

Trucker

Truck # / Disposal Area:

Driver On ☐ ☐ Off Time Date

Gross ===65100LB FEB 7 7 32 AM '83
===36780LB FEB 7 4 57 PM '83

Tare

Net 37

☐ CASH

☐ CHARGE

☐ WEIGHT ONLY

Commodity—Price—Spec. Info.

Weigher

Driver's Signature

CUSTOMER COPY

ENVIRONMENTAL TRANSPORT GROUP, INC. ☒ **DEVCON INC.** ☐

P.O. BOX 296, FLANDERS, N.J. 07836

OFFICE/ 584-2320 • WAREHOUSE/ 347-9730

G

MANIFEST # 0065423 ☐ A ☐ C

TRUCK # 204 TR # 112

DRIVER Bob Huber

PICK UP: Fri 2-4-83 / 8:00 / 50471
DATE / TIME / W.O. #

NAME: Givaudan Corp.

CODE 176 AM
RAA

ADDRESS: 100 Delawana Ave
Clifton, N.J.

Charles Lord

TIME IN: 800 TIME OUT: 930 TOTAL TIME: ______ $ ______

DELAY EXPLANATION: ______

Stephen Puzzo Givaudan
SIGNATURE: (PICK UP)

INTERMEDIATE: ______
NAME ADDRESS

TIME IN: ______ TIME OUT: ______ TOTAL TIME: ______ $ ______

DELAY EXPLANATION: ______

______
SIGNATURE: (INTERMEDIATE)

UNLOAD: Mon 2-7-83 / 7:30
DATE TIME

NIAGARA ☒ OHIO ☐ OTHER ______ $ 90 —

TIME IN: 2/7 7:32 - 4:57 TIME OUT: 2/8 7:22 - 11:38 TOTAL TIME: 2/8 3 2/7 7½ $ 315 —

DELAY EXPLANATION: DRUMS MISCODED, HAD TO STAY OVER NIGHT
SEE OFF-SPEC Layover 350 —

N B
SIGNATURE: (UNLOADING SITE)

$ ______ $ 1565 —

Scale Ticket # 25477

Product Codes
176-MTX

TRUCK DEMURRAGE & SPOTTING REPORT

W.O. # 50471	Customer & Location Giradaun Clifton	Hauler E.T.G.I.	2-4-83 Date

Loading Time 2-4-83
Scheduled Time 8:00
Arrival 8:0
Departure 9:30

Reason for Delay (To be Completed)

Hauler Signature

Authorized Signature (Generator)

Pump & Hose ☐ Check if applicable
Plastic Liner ☐

Unloading Time 2-7-83
Scheduled Time 7:30
Arrival 7:32 2/7-4:57
Lab-In 7:32 2/8
-Out
Departure 10:38 2/8

Reason for Delay (To be Completed by CECOS)
DRUMS IMPROPERLY CODED
HAD TO STAY OVER NIGHT
SEE OFFSPEC

Hauler Signature

Authorized Signature (CECOS Personnel)

Service Type
Dump Trailer ☐
Tandem ☐
Box Van ☒
Tanker ☐
Roll Off ☐

Lugger ☐
Vac Truck ☐
Vac Trailer ☐
Portal to Portal for Vac Service (# of Hours) ________

Charges to be Billed
Base Price $ ________
Detention (Loading) ________
(Unloading) ________
Spotting ________
Other ________

HAULER

Polychlorinated Biphenyls

On Top: 176 M

PCB yellow label

On Sides:

Polychlorinated Biphenyls
UN 2315

ORM E

RQ

GIVAUDAN CORP.
125 DELAWANNA AVE
CLIFTON, N.J. 07014

EPA ID No. NJD 002156354

N.J. MANIFEST No. 65423

GROSS TARE NET

Trichlorophenol

On Top: 176R

yellow label

On Sides: Trichlorophenol

NA 2020

ORM A

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY

GIVAUDAN CORP.

125 DELAWANNA AVE.

CLIFTON, N.J. 07014

EPA ID No. NJD 002156354

N.J. MANIFEST No. GS423

GROSS TARE NET

Hexachlorophene (not the filter coke)

On Top: 176 AA

[illegible] yellow label

On Sides: Hexachlorophene
UN 2875

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY

GIVAUDAN CORP.
125 DELAWANNA AVE
CLIFTON, N.J. 07014

EPA ID No. NJD 002156354

N.J. MANIFEST NO. 65423

GROSS TARE NET

CECOS INTL. INC.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS

5001-E Greentree Executive Campus
Route 73
Marlton, N.J. 08053-1566
(609) 983-6662

December 20, 1982

Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Attn: Mr. J. Angiolini

Dear Mr. Angiolini:

CECOS International has recently completed a thorough treatability and acceptability review of the information supplied to us by your firm on a Waste Product Record form.

As a result of this review, we are pleased to inform you that the materials described in the attached documents are approved and are acceptable for receipt, treatment and disposal by CECOS International. Please refer to the description, approved disposal method, disposal price and any special conditions which may be applicable.

In conformance with Section 264.12(b) of the Resource Conservation and Recovery Act, and NYCRR Part 365.2(b)(i)(ii) and (iii), CECOS International certifies that it has the appropriate permits for, and will accept from you, the materials described in this proposal.

Thank you very much for your interest and cooperation and we are looking forward to serving your total waste disposal requirements.

Very truly yours,

CECOS INTERNATIONAL, INC.

Gary F. Martini (mg)

GARY F. MARTINI
Regional Sales Manager

GFM/cad
Attachment

cc: E. J. Boccuzzi - CECOS

CECOS INTERNATIONAL, INC.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS

12/20/82

Waste Product Description	Product Code	Disposal Method	Disposal Price
Hexachlorophene	176-AA	Secure Chemical Mgmt. Facility-NY	$65/per drum
Spill of low flash organic liquids	176-Z	Secure Chemical Mgmt. Facility CECOS/CER Williamsburg, Ohio	$38/per drum

Important Conditions:

1. Waste materials which are approved for Secure Chemical Management Facility (SCMF) must meet the following requirements:

   - NO VOID SPACE IN DRUM CONTAINERS
   - NO FREE LIQUID PRESENT

2. Containerized waste materials should bear the Product Code Number assigned to each waste product. This code should be clearly stenciled on the top of each drum.

3. In the event materials arrive for disposal with either requirement not in conformance, CECOS has the capability of processing these materials. If processing costs are projected to be minimal, this cost will not be passed on to the generator. If processing costs are not minimal, CECOS Customer Services Department will notify your firm with a detailed description of material variance and will calculate the associated costs.

CECOS
INTL. INC.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS

5001-E Greentree Executive Campus
Route 73
Marlton, N.J. 08053-1566
(609) 983-6662

August 25, 1982

Givaudan Corporation
125 Delawanna Ave.
Clifton, N. J. 07014

Ohio only

8/25/82

Attn: Mr. Charles A. Lord

Dear Mr. Lord:

CECOS International, Inc is pleased to offer you the following quotation for disposal of PCB oil.

CODE	MATERIAL	DISPOSAL PRICE
176-ZT	PCB oil 25,000 ppm	$350/drum

If you have any questions, please do not hesitate to call.

Thank you for the opportunity to be of service.

Very truly yours,

E. John Boccuzzi/cm

E. John Boccuzzi
Technical Sales Representative

EJB/cm

Hank Pietras

Cecos

513-681-5731

concerning

PCB

material

5

P/U

Delivery 9/26/83

W.O. # 61373

11AM

176H

41

176A

Balance
12

53

PSA

Storage Ou...

10/29/8

+

176S - 6

CE

48795

New Manifest #

9AM

176ZY-1

513-681-573.

Polychlorinated Biphenyls (liquid)

On Top: 176 ZT

On Sides:  PCB yellow label

Polychlorinated Biphenyls
UN 2315
ORM E   RQ

GIVAUDAN CORP
125 DELAWANNA AVE
CLIFTON, N.J. 07014

EPA ID NO. NJD 002156354

NJ. MANIFEST No. 181359

GROSS   TARE   NET

DOT 17E

Form VHW-001 (5/82)

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE MANIFEST

Please TYPE all information.

PART A: SEND TO DISPOSER'S STATE — DOCUMENT NO. NJ 0181359

GENERATOR NAME	PHONE (INCLUDE AREA CODE)	EPA ID NO.
ADDRESS (STREET - CITY - STATE)		ZIP CODE
TRANSPORTER NO. 1	PHONE (INCLUDE AREA CODE)	EPA ID NO.
ADDRESS (STREET - CITY - STATE)		ZIP CODE
TRANSPORTER NO. 2	PHONE (INCLUDE AREA CODE)	EPA ID NO.
ADDRESS (STREET - CITY - STATE)		ZIP CODE
TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY	PHONE (INCLUDE AREA CODE)	EPA ID NO.
SITE ADDRESS (STREET - CITY - STATE)		ZIP CODE

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE
THIS FORM IS NO. ____ OF A TOTAL OF ____. THE FIRST MANIFEST DOCUMENT NO. IS NJ →

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS NO.	CONTAINERS TYPE	EPA HAZ CODE	EPA WASTE TYPE
Waste Flammable Liquid, poisonous, n.o.s.	Flammable Liquid	1992						I	D001
* [illegible] Polychlorinated Biphenyl (RQ 10/4.5)	ORM E	2315						T	NONE
4.									
5.									
*PCB contents 100% of Total Weight									

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)

~~Steel drums of [illegible] netting [illegible] pounds.~~
____ Steel drums of solid non-hazardous still bottom residues
____ Steel drums of solid non-hazardous boiler ash

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labelled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the State. The wastes described above were consigned to the Transporter named. The Treatment, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE - ALSO PRINT SIGNATURE	TITLE	DATE SHIPPED (MO. DAY YR.)	EXPECTED ARRIVAL DATE (MO. DAY YR.)
TRANSPORTER NO. 1 SIGNATURE AND CERTIFICATION OF RECEIPT OF SHIPMENT - ALSO PRINT SIGNATURE	TRANSPORTER NO. 1 VEHICLE ID NO. N J S W A S		DATE RECEIVED (MO. DAY YR.)

TEAR AT THIS PERFORATION

PART B: SEND TO DISPOSER'S STATE	GENERATOR NAME	GENERATOR EPA ID NO.
TRANSPORTER NO. 1 SIGNATURE AND CERTIFICATION OF DELIVERY AND NON-TAMPERING WITH SHIPMENT - ALSO PRINT SIGNATURE		DATE DELIVERED (MO. DAY YR.)
TRANSPORTER NO. 2 SIGNATURE AND CERTIFICATION OF RECEIPT OF SHIPMENT - ALSO PRINT SIGNATURE	TRANSPORTER NO. 2 VEHICLE ID NO. N J S W A S	DATE RECEIVED

AVOID VERBAL INSTRUCTIONS

To Mr. - Miss ______ Date 9/13/83

Subject Residue Drs for Dump

Hexachlorophene Filter Cake — 55

Phenol & Toluene in Sand — 5

Gamma Di Bromo am Brol — 4

Fly Ash — 32

Butyl Benzaldehyde Res. + Sand — 54

Exhausted Natural Resin — 15

Musk Tibetene Rec Sol Free Finished — 16

From ______

over

Hydrolene Crude
& Sand — 4

Nitro Musk Sludge
Rec Sewer Or Dump — 2

5-Tert-Butyl 2,4,6
Trinitro M-Xylene
Mixture — 3

De Con tarp — 14

Musk Alpha
Residue — 2

Recovered 75% H2
Soda Ash
Bldg 81 X — 5 drs

Oil Layer From
Sewer Pit
Bldg 85 X
(Liquid) — 8 drs

SHIPPING AUTHORIZATION

#13

SHIP TO [illegible]

BILL

Via [illegible]

1. REASON FOR SHIPPING

- ☐ INCORRECT MATERIAL (RECEIVED/DELIVERED) AGAINST P.O. ______ OR R.R. ______
- ☐ INFERIOR QUALITY (RECEIVED/DELIVERED) AGAINST P.O. ______ OR R.R. ______

ABOVE MATERIAL (WILL/WILL NOT) BE REPLACED WITH CORRECT (MATERIAL/QUALITY) AGAINST SAME ORDER

- ☐ FOR (REPAIR/MODIFICATION) & RETURN AGAINST P.O. ______
- ☐ FOR USE WITH P.O. ______ FOR ______
- ☐ TO ADJUST INVENTORY
- ☐ SALE – CUSTOMER ORDER # ______
- ☐ ______

2. METHOD & TERMS OF SHIPMENT

- ☐ F.O.B. POINT: ______
- ☒ FREIGHT COLLECT
- ☐ FREIGHT PREPAID
- ☒ THEIR TRUCK
- ☐ OUR TRUCK
- ☐ AIR FREIGHT
- ☐ PARCEL POST
- ☒ SALESMAN ______ SIGNATURE OF THEIR SALESMAN OR TRUCKER
- ☐ UNITED PARCEL
- ☐ TRUCK
- ☐

MERCHANDISE TO BE SHIPPED

A. Miscellaneous Items

QUANTITY	DESCRIPTION/REMARKS & SPECIAL INSTRUCTIONS	UNIT PRICE	TOTA
1	Tanktruck containing the following [illegible]:		
	(a) Complete stock of [illegible] [illegible]		
	(b) Complete stock of G-4 Fune Residue		
	(c) Approximately 10 gallons of a Residue/Toluene mixture from G-11		
	(d) 1250 [illegible]		
	TOTAL REQUIRED = 5,500 GALLONS		

B. Chemicals

______ QUANTITY ☐ LBS. ☐ GALS. ☐ ______ PRODUCT ______ OUR LOT # ______ $ ______ PER ☐ ☐ ☐

C. Empty Containers

______ QUANTITY ☐ NEW ☐ USED ______ CAPACITY ☐ GALLON ☐ OUNCE ☐ ☐ LACQUER LINED ☐ UNLINED ☐ ☐ TIGHT HEAD ☐ OPEN HEAD ☐ ☐ SIDE FILL ☐ SIDE & HEAD FILL ☐ ☐ STEEL ☐ FIBRE ☐ ☐ DRUM ☐ PAIL ☐ ☐ $ ☐ NO CHARGE ☐

DATE	REQUESTED BY	AUTHORIZED BY	PACKED BY
11/7/7[illegible]	[illegible]	[illegible]	[illegible]

SHIPPED VIA	DATE SHIPPED	DATE BILLED	PARCEL POST CHARGES
All C[illegible], E.S.C.[illegible]	8/22/77		

2663 5M 8/77

PURCHASING DEPT.

SHIPPING AUTHORIZATION

SHIP TO Northeast Solite Company
Kings Highway - P.O. Box 437
Mt. Marion, New York 14303

BILL

1. REASON FOR SHIPPING

- ☐ INCORRECT MATERIAL (RECEIVED/DELIVERED) AGAINST P.O. ________ OR R.R. ________
- ☐ INFERIOR QUALITY (RECEIVED/DELIVERED) AGAINST P.O. ________ OR R.R. ________

ABOVE MATERIAL (WILL/WILL NOT) BE REPLACED WITH CORRECT (MATERIAL/QUALITY) AGAINST SAME ORDER

- ☐ FOR (REPAIR/MODIFICATION) & RETURN AGAINST P.O. ________
- ☒ FOR USE WITH P.O. G-40537/AC OF ALL COUNTY ENVIRONMENTAL SERVICE CORP. FOR Disposal of Waste
- ☐ TO ADJUST INVENTORY
- ☐ SALE - CUSTOMER ORDER # ________
- ☐ ________

2. METHOD & TERMS OF SHIPMENT

- ☐ F.O.B. POINT: ________
- ☒ FREIGHT COLLECT
- ☐ FREIGHT PREPAID
- ☒ THEIR TRUCK
- ☐ OUR TRUCK
- ☐ AIR FREIGHT
- ☐ PARCEL POST
- ☐ SALESMAN ________ SIGNATURE OF THEIR SALESMAN OR TRUCKER
- ☐ UNITED PARCEL
- ☐ TRUCK
- ☐ F

MERCHANDISE TO BE SHIPPED

A. Miscellaneous Items

QUANTITY	DESCRIPTION/REMARKS & SPECIAL INSTRUCTIONS	UNIT PRICE	TOTAL
3	Tank truck Truck Loads containing unwanted materials: a) Approx. 5,000 gals. residues from Musk Xylol Musk Ambrette b) Approx. 10,000 gals. of Musk solution containing Musks, Toluene, Lights fractions from Butyl Xylene (Hydrocarbons). FLAMMABLE LIQUID 6,000 gallons shipped 4/22/80	No	Char

B. Chemicals

6,000 gallons " 4/25/80
6,000 gallons " 5/29/80

☐ LBS. ☐ GALS. ☐ QUANTITY ________ PRODUCT ________ OUR LOT # ________ $ ________ PER ☐ LI ☐ GA ☐

C. Empty Containers

QUANTITY ☐ NEW ☐ USED CAPACITY ☐ GALLON ☐ OUNCE ☐ ☐ LACQUER LINED ☐ UNLINED ☐ ☐ TIGHT HEAD ☐ OPEN HEAD ☐ ☐ SIDE FILL ☐ SIDE & HEAD FILL ☐ ☐ STEEL ☐ FIBRE ☐ ☐ DRUM ☐ PAIL ☐ ☐ $ ☐ NO CHARGE ☐ /UI

DATE	REQUESTED BY	AUTHORIZED BY	PACKED BY
4/17/80	G. F. Talarico	R. A. Snyder	
SHIPPED VIA	DATE SHIPPED	DATE BILLED	PARCEL POST CHARGES

2843 8M 8/77

SHIPPING DEPT.

PURCHASING WILL ASSIGN "D" NUMBER AND RETURN SET TO ORIGINATOR (5 COPIES). ORIGINATOR KEEPS SIXTH OR LAST COPY. ORIGINATOR SENDS "D" PAPERS SET (4 COPIES) AND MATERIAL TO SHIPPING DEPT. IF A CHEMICAL FLAVOR OR FRAGRANCE COMPLETE ATTACHED HAZARDOUS/NON HAZARDOUS SHIPMENT DECLARATION.

GIVAUDAN CORPORATION

D 9037

SHIPPING AUTHORIZATION

SHIP TO

BILL

Northeast Solite Company
Kings Highway - P.O. Box 437
Mt. Marion, New York 14303

1. REASON FOR SHIPPING

☐ INCORRECT MATERIAL (RECEIVED/DELIVERED) AGAINST P.O. ______ OR R.R. ______

☐ INFERIOR QUALITY (RECEIVED/DELIVERED) AGAINST P.O. ______ OR R.R. ______

ABOVE MATERIAL (WILL/WILL NOT) BE REPLACED WITH CORRECT (MATERIAL/QUALITY) AGAINST SAME ORDER

☐ FOR (REPAIR/MODIFICATION) & RETURN AGAINST P.O. ______

☒ FOR USE WITH P.O. G 41330 FOR Disposal of Waste Chem

☐ TO ADJUST INVENTORY

☐ SALE – CUSTOMER ORDER # ______

☐ ______

2. METHOD & TERMS OF SHIPMENT

via All County Environmental Se

☐ F.O.B. POINT: ______ ☒ THEIR TRUCK ☐ PARCEL POST ☐ UNITED PARCEL ☐ TRUCK

☒ FREIGHT COLLECT ☐ OUR TRUCK

☐ FREIGHT PREPAID ☐ AIR FREIGHT ☐ SALESMAN ______

SIGNATURE OF THEIR SALESMAN OR TRUCKER

MERCHANDISE TO BE SHIPPED

A. Miscellaneous Items

QUANTITY	DESCRIPTION/REMARKS & SPECIAL INSTRUCTIONS	UNIT PRICE	T
2	Tanktruck loads containing unwanted chemicals for burning at Solite's plant (a) approximately 7,500 gallons of Musk Xylol, Musk Tibetene, Musk Ambrette & Moskene residues (b) approximately 4,500 gallons of the following solvents: Redistilled Heptane r/f Leaf Alcohol Crude Toluene r/f Aubepine Toluene r/f Cloveleaf Terpenes - Eugenol C-9 Toluene r/f Giv 81-0236 Crude Toluene r/f Guaiacwood Acetate Extra Toluene r/f Dimethyl Anthranilate Toluene r/f Cetonal Toluene r/f Alpha NP Crude		

B. Chemicals

☐ LBS.
☐ GALS.
☐

QUANTITY ______ PRODUCT ______ OUR LOT # ______ $ ______ PER

C. Empty Containers

☐ NEW ☐ GALLON ☐ LACQUER LINED ☐ TIGHT HEAD ☐ SIDE FILL ☐ STEEL ☐ DRUM ☐ S

☐ USED ☐ OUNCE ☐ UNLINED ☐ OPEN HEAD ☐ SIDE & HEAD FILL ☐ FIBRE ☐ PAIL ☐ NO CHA

QUANTITY ______ CAPACITY ______

DATE	REQUESTED BY	AUTHORIZED BY	PACKED BY
5/21/80	G. F. Talarico	[signature]	

No.________ EXECUTIVE OFFICES – CLIFTON, NEW JERSEY

Giv PO # 30819

From________ To Drum Dollars

Load of________

(For Carts) ORIGINAL #20908253

59 770 Gross

26480 Tare

Net

Driver on / off

Fees________ Date________ 19__

4/3/80 /Weigher.

3/80

PRINTED IN U.S.A.

FTON, N.J. BOX X'D BELOW)

SHIPPER'S NO.

W.O. 20150

[illegible]

☐ BELVIDERE, N.J.

☐

CONSIGNED TO AND DESTINATION

CECOS INTERNATIONAL INC
4626 Royal Avenue
Niagara Falls, N.Y. 14303

ROUTE

DELIVERING CARRIER

CAR OR VEHICLE INITIALS & NO.

CARRIER'S NO. Approved From A-5027 for 76 drums 5/5/

†CHARGES ARE TO BE: CA

☐ PREPAID (SHIPPER'S NUMBER MUST APPEAR ON FREIGHT BILL)

☐ COLLECT

CUSTOMER ORDER NO.

NO. PKGS.	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS		*WEIGHT (SUB. TO COR.)	CLASS OR RATE	CK. COL.
—	(14 DRS – 176A), (22 DRS – 176B), (40 DRS – 176C)				
	STEEL DRUMS CARTONS PAILS	FLAMMABLE LIQUID, N.O.S. (NMFC ITEM 60000, 72910, 144900 SUB.1)		LTL 70 TL 40	
76	STEEL DRUMS FIBRE DRUMS PAILS CARTONS	WASTE CHEMICALS N.O.I. (NMFC ITEM 60000) --- ESSENTIAL OILS N.O.I. (NMFC ITEM 144900 SUB. 1)		LTL 70 TL 40	
	STEEL DRUMS FIBRE DRUMS PAILS CARTONS	FLAVORING COMPOUNDS N.O.I. (NMFC ITEM 72910) --- IMITATION FLAVORS N.O.I. (NMFC ITEM 72910)		LTL 70 TL 40	
	STEEL DRUMS CARTONS PAILS	INDUSTRIAL PROCESS WATER TREATING COMPOUNDS (LIQUID) N.O.I. (NMFC ITEM 50227 SUB. 1)		LTL 60 TL 35	

NOTE— WHERE THERE IS A RATE DEPENDENT ON VALUE, THE AGREED OR DECLARED VALUE OF THE PROPERTY IS HEREBY SPECIFICALLY STATED BY THE SHIPPER TO BE NOT EXCEEDING:

50¢ PER POUND

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement.
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Givaudan Corporation

Received $________
to apply in prepayment of the charges the property described hereon.

Agent or Cashier.

per________
(The signature here acknowledges only amount prepaid.)

Charges advanced $________

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

†Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Interstate Commerce Commission.

†This is to certify that the above named materials are properly classified, described, packaged marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.

†The fibre drums, drums, pails, cartons or carboys used for this shipment conform to the specifications set forth in maker's certificate thereon, and all other requirements of the Consolidated Freight Classification.

† PLACARDS PROVIDED BY
GIVAUDAN ☐
CARRIER ☐

GIVAUDAN CORPORATION, SHIPPER

Material: Sent to Dump For Disposal

176 A

	Type of Used on 81
Butyl Benzaldehyde Residue	OH
Mixed Residue for Dump	TH
Oranger Crystals Residue	TH
Corps N-112 Residue	TH
Delagene Residue	OH

176 B

Lilial Residue	OH

176 C

Dehydrolilial Residue	OH

176 D

Hexachlorophene filter cake	OH

176 E

Asbestos	OH (Fib

176 G

Musk Ambrette Residue Powder	OH

Residue Drum Disposal

Date	# of Drums		Destination
4/23/80	80	68 still bottoms 4 Asbestos 8 Hexachlorophene	CECOS INTL INC N
4/22/80	6,000 gallons		Solite via All County En. Ser. C
4/25/80	6,000 gallons		Solite via All County En. Ser. C
5/20/80	6,000 gallons		Solite via All County En. Ser. C
5/27/80	84	68 still bottoms 8 Musk Ambrette Res. Pwds 8 Asbestos	CECOS INTL INC N
5/28/80	5,500 gallons		Solite via All County En. Ser. C

Residue Drum Disposal

Date	# of Drums	Destination
6/30/78	80	Newco Chemical Waste Systems
7/5/78	80	" " " "
7/5/78	76	" " " "
7/11/78	76	" " " "
7/13/78	76	" " " "
7/14/78	76	" " "
7/31/78	67	" " " "
9/19/78	80	" " "
9/19/78	80	" " "
11/2/78	80	" " "
12/8/78	58 + 22 Hexachlorophene Filter Coke	" " "
1/16/79	55 +24 " "	" " "
3/6/79	28 + 51 " "	" " "
3/15/79	80 + 1 Asbestos	" " "
4/27/79	52 + 24 Hex. F. Hercoke + 9 Asbestos	" " "
5/9/79	79 Musk Ambrette Residue Powder	" " "
5/21/79	80	" " "
7/13/79	80	" " " "
8/23/79	5,500 gallons	Solite via All County En.
9/20/79	79	Newco Chemical Waste Systems
2/27/80	2	Interex Corp, Natick, Mass
3/18/80	90	CECOS International Inc
3/25/80	76	" " "
3/27/80	76	" " "
4/1/80	76	" " "
4/3/80	76	" " "

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

March 9, 1978

No. 125

Dr. P. Oberhansli
L. Givaudan & Cie. S.A.
1214 Vernier - Geneva
Switzerland

Subject: CELAMERCK T C P
Response to Telex No. 585

Dear Peter:

The following is a summary of the available data obtained to date on the Celamerck TCP and G-11 made from it.

It is our understanding that Drum No. 2 is more representative of the typical production material available from Celamerck and we have therefore concentrated our analytical efforts on this material. We have reanalyzed the TCP in an FFAP column according to Celamerck's conditions you described in Telex #1293 (February 21, 1978).

Shown below is a comparison of our complete analysis of Drum #2 on the FFAP column with the analysis provided by Celamerck on a similar column:

VPC Analysis of Celamerck Drum #2 on "FFAP" Column

	Givaudan	Celamerck
2,4-Dichloroanisole[a.]	0.13	--
2,5-Dichlorophenol	0.12	0.1
2-Chloro-5-methoxyphenol[b.]	0.04	--
2,4,6-Trichlorophenol[c.]	0.16	--
2,3,6-Trichlorophenol	0.17	0.1
2,4,5-Trichlorophenol	98.40	99.4
2,5-Dichloro-4-methoxyphenol	0.17	0.2
2,4-Dichloro-5-methoxyphenol	0.71	
	99.90	99.8

a. Previously referred to (Telex No. 393) as Unknown #1
b. Previously referred to (Telex No. 393) as Unknown #2
c. Previously referred to (Telex No. 393) as Unknown #3

There are significant differences between our analyses - TCP assay: 98.40% vs. 99.4% and dichloromethoxyphenols: 0.89% vs. 0.2%. Nonetheless, a bulking of Celamerck Drums No. 1 and 2 produced G-11 under plant conditions which our Quality Control group would approve for sale to Sterling-Winthrop. Liquid chromatography of this G-11 did show small amounts of three impurities (Telex No. 393) which are present in G-11 ex Dow TCP, Pure in only trace amounts.

Because of the urgency conveyed to us regarding the need to make a decision on the Celamerck TCP, the following is recommended:

1. Try to obtain tighter specifications on the phenolic impurities - particularly the dichloromethoxyphenols. We have previously suggested 0.2% max. and believe this is a realistic value. Celamerck has proposed 1.0% max and we could live with this if we had to.

2. Although the sample of Celamerck TCP analyzed so far contains very little monochloromethoxyphenols, the max. allowable level of this material should be specified. Dow TCP containing $>$ 0.2% 2-chloro-5-methoxyphenol produced beige G-11.

3. Although the current TCDD specification for Dow TCP, Pure is $<$10 ppb, we believe that it consistently contains $<$1 ppb TCDD. Accordingly we urge you to have Celamerck agree to provide TCP with $<$ 5 ppb TCDD. If this is not possible, we would insist that they provide the exact TCDD analysis for each batch or lot with a maximum of 10 ppb (Celamerck proposed max. 15 ppb).

If you need additional information, do not hesitate to contact us.

Sincerely yours,

GIVAUDAN CORPORATION

Hal Brandman

H. A. Brandman

HAB:cj

cc :Dr. J. Dorsky
Mr. J. Broderick
Mr. S. Gold
Dr. M. Manowitz

Let's protect our earth

RECEIVED

APR 5 1988

QUALITY ASSURANCE
GIVAUDAN CORPORATION

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT
John J. Trela, Ph.D., Director
401 East State St.
CN 028
Trenton, N.J. 08625
609 - 633 - 1408

RECEIVED
APR 6 1988

04 APR 1988

L. A. Levy, Director
Quality Quality Assurance
Givaudan Corporation
Delawanna Avenue
Clifton, New Jersey 07015-5034

Dear Mr. Levy:

This letter will inform you that I have received QA/QC clearance, from the appropriate personnel within this Department, to accept the data from the three samples submitted by Cal analytical. Therefore, as per the workplan attached to the February 16, 1988, Amended Administrative Consent Order, sample area #G-11 is cleared for construction and the boundaries of the Contaminated Process Area are altered as defined by the dashed line on Drawing A9565, Rev. 2, which was attached to the above mentioned workplan.

Sincerely,

Joseph A. Karpa
Case Manager
Bureau of Case Management

JK/JK

cc: H. A. Brandman, Givaudan
Dennis Hart, Section Chief, BCM
Michael Schuit, ORS
William Storm, BEERA
BCM Files

cc W. HYATT
A. FUNK
R. CANNAHER
R. TAVARES
J. CHRISTENSEN
R. ZIPFEL

GIVAUDAN

April 4, 1988

Mr. J. Karpa
NJDEP, Div. Hazardous Waste Mgnmt.
401 East State St.
CN-028
Trenton, NJ 08625

Dear Mr. Karpa:

Below is a summary of the Dioxin Excavation of Location G-11 on the Givaudan plant site.

In accordance with the Amended Administrative Consent Order executed on February 16, 1988, the excavation and containment of soil from the area north of Bldg. 68 containing sample location G-11 was undertaken on Feb. 20 and 21, 1988 under the auspices of the NJDEP. The personnel involved with this excavation were:

Givaudan,
  Mr. Leonard Levy
Environmental Resource Management (ERM),
  Mr. Gunnar Emilsson
BES Environmental Specialists (Excavating Contractor)
  of Wilks Barre, Pennsylvania,
  Mr. Boyd Dunn
  Mr. Ron Balut
New Jersey Department of Environmental Protection
  Mr. J. Karpa
  Mr. T. Cozzi

The equipment utilized for this excavation was primarily a backhoe and hopper assembly (a unit utilized to transfer the soil from the backhoe bucket to the 55 gal. open head drum).

Prior to locating the equipment at the excavation site, the equipment was washed with soap and water, rinsed with tap water and steam cleaned. The equipment was then moved to the excavation site and the hopper assembly positioned on plastic sheeting to provide containment of any spilled soil. The personnel involved in the direct excavation were dressed in Level C protection.

The excavation began at approximately 9:45 A.M.on Feb. 20, 1988 with the existing tarp being removed and placed in a 55 gal. open head drum. As per the on-site agreement, the soil was excavated in 12" levels and transferred to 55 gal. open head drums.

The excavation began by removing the first 12" of soil from the entire excavation area. Forty-eight drums of soil of the 0-12 level were excavated with samples taken at the 12" level from the east and west side of the excavation. Excavation then continued on the west side to the depth of 24". Sixteen drums of 12-24" soil were collected. A soil sample was taken at the 24" level on the west side of the excavation. Excavation then continued to the depth of 36". Duplicate soil samples were taken at this depth and marked "36-1 West" (one sample to be archived). Work was concluded at 6:30 P.M.

On Feb. 21, 1988, excavation continued to a depth of 24" in the center of the excavation. Excavation was then continued to 36". Duplicate soil samples were taken and marked "36-2 Center". The east side of the hole was then excavated to a depth of 24". A soil sample was taken at the 24" level on the east side and marked "24" East". Excavation continued to the 36" level on the east side. Duplicate samples were taken at this location and marked "36-3 East". The excavation work was completed at 1:30 P.M.

The drums were stencilled "Contaminated Soil 2-20-21-88" with the appropriate depth of excavation (0-12, 12-24, 24-36) being stencilled below the name. The sealed drums were placed on wooden pallets and moved, as agreed, to a section of the "contaminated non-process area" on the existing tarps (see attached site map).

A total of 128 drums were excavated. The number of drums from each level are listed below:

48 drums of 0-12" soil
36 drums of 12-24" soil
44 drums of 24-36" soil.

The drums were covered with polyethylene tarps to prevent exposure to environment.

Sampling equipment and tools were decontaminated with a tap water rinse, a soap and water wash, a distilled water rinse, an acetone rinse and a hexane rinse. The backhoe and hopper were rinsed with tap water followed by a soap and water wash, an acetone rinse and a hexane rinse. The backhoe and hopper were soap and water washed and steam cleaned prior to leaving the site.

GIVAUDAN CORPORATION

The 3 samples taken at the 36" level labelled, "36-1, 36-2 and 36-3" were packed under the supervision of the NJDEP and shipped to California Analytical Laboratories (Enesco, Inc.) in Sacramento, California. The duplicate 36" samples and the samples taken at the 12" and 24" levels were sealed in a carton and archived for future analysis, if necessary.

In accordance with paragraph 18 of the Amended Administrative Consent Order, the drums are being inspected daily for integrity with a written log maintained at Givaudan.

I trust you will find the above adequately defines the program as per the Amended ACO. If you have any questions or comments, please feel free to contact me.

Sincerely,

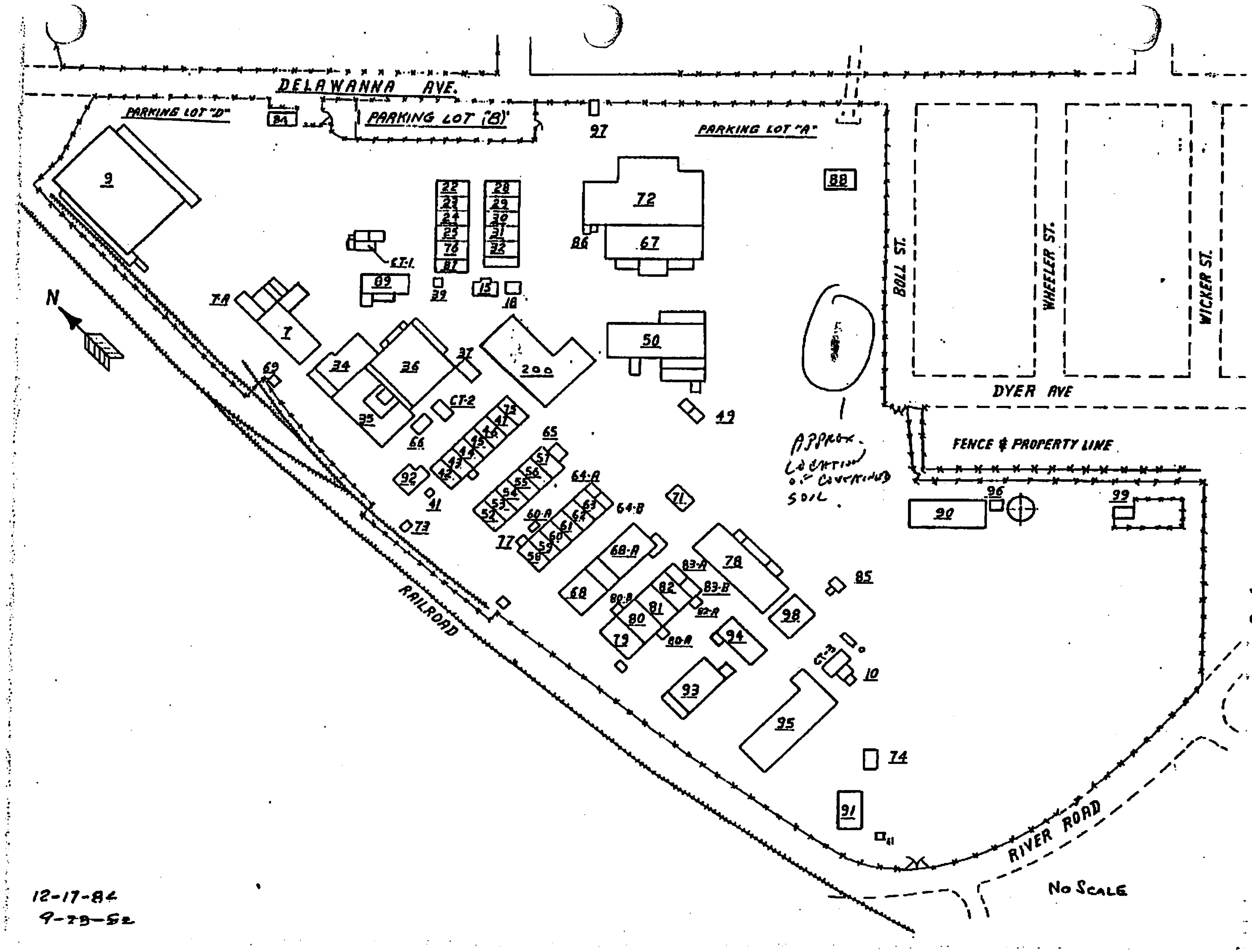
GIVAUDAN CORPORATION

Leonard A. Levy
Director,
Quality Assurance

LAL:jmb
EXCAVATN.AP8

Encl.

cc: H. Brandman
R. Carraher
A. Funk
W. Hyatt
R. Tavares
C. Zipfel


DELAWANNA AVE.
PARKING LOT "D"
PARKING LOT "B"
PARKING LOT "A"
BOLL ST.
WHEELER ST.
WICKER ST.
DYER AVE
FENCE & PROPERTY LINE
APPROX. LOCATION OF COVERING SOIL
RAILROAD
RIVER ROAD
NO SCALE
N
12-17-84
9-29-52

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

Hal,
This report was sent to the E.P.A. some time ago. I thought you might be interested.
Steve T

Givaudan has been using waste materials as an alternate fuel source for many years. A record of what is consumed is maintained by boiler room personnel and it is the log of the first six months of 1979 that we copied and are sending to you. It shows the date the material was received by boiler room personnel, the number of days it was in the hot box (some material is solidified and must be melted), the date it was pumped into the mixing tank, the lot number (which further identifies the material), the product from where the material was obtained or its name, and finally the date it was burned.

The non-commercial fuel is generated from our own plant and consists of materials we consider as uneconomical for further processing such as byproducts; lights, tails, and residues from distillations; solvents; etc. For the most part these are composed of carbon, oxygen and hydrogen. We do not use halogenated materials or those which contain nitrogen. Some of the names are straight forward and can be found in a chemical dictionary; others are found in the enclosed Givaudan Index and still others are listed in item No. 6 (Givaudan Products and Intermediates) already sent to you. Some drums marked "mixed solvents" or "solvent solution" consist of such solvents as toluene, xylene, heptane, methanol, etc. The "mixed residues" can only be derived from the aforementioned products. Incidentally, we have had several lots of these residues tested for sulfur and heavy metals and found them to be below the values for commercial fuel. We have also had stack emissions tested, "Report on Emission Testing - Boiler #5", a copy of which has already been sent to you.

JAN 17 1984

We are also enclosing a copy of a report about boiler operations which includes the burning of non-commercial fuel.

Very truly yours,

GIVAUDAN CORPORATION

George Talarico/lk

George Talarico,
Director of Regulatory Affairs

Boiler Operations at Givaudan Concerning the Burning of Non-commercial Alternate Fuel.

Givaudan has four (4) water tube boilers which operate within the following parameters:

1) Steam conditions - 300 psig saturated.

2) Average hourly steam load

Summer - 55,000#

Winter - 80,000#

Max. load - 120,000#

3) Steaming capacity - 190,000#

3 Boilers @ 30,000 each

1 Boiler @ 100,000

4) Fuel usage - 466 x 10^9 btu/year

Heavy oil - 30%

Gas - 60%

Non-commercial fuels - 10%

Alternate fuel can be burned in two of the small boilers. Two out of three burners on each boiler are fitted out to burn this material.

During an average month, 30,000 gals. of alternate fuel are burned. One burner consumes 100 gal. per hour. This requires that only one burner be in operation for 300 hours per month.

In 1979, 246,000 gal. of alternate fuel were burned. It is anticipated that this rate of burning will continue for the next several years.

Alternate fuel is a mixture of still bottoms, spent solvent, unsold product, and byproducts. It has been analyzed for sulfur, nitrous compounds and heavy metals, and is well below minimum standards for commercial fuel.

The stack emissions, while burning alternate fuel, have been analyzed by John G. Reutter Associates and are well below the emissions standards required by the New Jersey Department of Environmental Protection.

Boiler Operations at Givaudan Concerning the Burning of Non-commercial Alternate Fuel.

The alternate fuel can be stored in two systems, each of which permits a batch to be compounded and tested before burning. Complete records of every barrel burned are maintained.

The firebox temperature during alternate fuel burning has been measured at over 2,000°F. which coupled with the retention time in the fire side of the boiler should reduce all compounds to their elemental state. When burning alternate fuel, the excess oxygen levels in the exit gases are increased to insure complete combustion.

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

Hoe: for your info JTA

March 27, 1984

Mr. T. Micai
Assistant Supervisor
Permits and Certification
N.J. Department of Environmental Protection
Bureau of Air Pollution Control
CN-027
Trenton, New Jersey 08625

Dear Mr. Micai:

Re: Submittal of Supplementary Information
Air Certificate Tracking No. 825353 & 825354
Boilers No. 4 and 5

As per your request, the questionnaire regarding our Boiler #4 and #5 waste fuel boiler and the hazardous waste boiler exemption [N.J.A.C. 7:26-12.1(b)(7)] is enclosed.

If you have any questions concerning this submittal, please contact me at (201) 365-8486.

Sincerely,

GIVAUDAN CORPORATION

John T. Angiolini

John T. Angiolini
Assistant Director
Environmental Affairs

JTA:lk
Enclsoures

Form VEM-003
1/79

Side 1

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

RECEIVED
DEC 22 12 18 AM '82
N.J. ST. DEPT. OF ENV. PROTECTION
DIV. OF ENV. QUALITY

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

TO: New Jersey Department of Environmental Protection
Bureau of Air Pollution Control
CN-027
Trenton, New Jersey 08625

Read Instructions Before Completing Application

SECTION A

1. Full Business Name: GIVAUDAN CORPORATION
2. Mailing Address: 125 Delawanna Avenue (No.) (Street) Clifton, N.J. (City) (State) 07014 (Zip Code)
3. Division and/or Plant Name: -Same-
4. Plant Location: -Same- (No.) (Street) (Municipality) (County)
5. Location of equipment on premises (Bldg., Dept., area, etc.): Building 7
6. Nature of business: Areomatic Chemicals
7. Estimated starting date of construction: Existing Boiler No. 5
8. Date equipment to be put in use: N/A
9. Plant Contact: William S. Turetsky, Director Safety & Environ. Protect. (201) 365-8527
Name (Print or type) / Title / Telephone No.

SECTION B

REASON FOR APPLICATION (CHECK ONE)

- ☐ New Equipment without Control Apparatus
- ☐ New Equipment with Control Apparatus
- ☐ New Control Apparatus on Existing Equipment
- ☐ Five Year Renewal of Certificate No. (s) ____
- ☒ Other (Explain) Grandfathered Boiler requiring Air Permit under Hazardous Waste Regulti
- ☐ Modification to Existing Equipment
- ☐ Modification to Existing Control Apparatus
- ☐ Painting Tank White

SECTION C

STACK INFORMATION (EQUIVALENT STACK INFORMATION)

1. Company Designation of Stack (s): No. 5 Boiler Stack
2. Previous Certificate Numbers (if any): None
3. a. Number of Sources Venting to this Stack: 1 (Complete a separate VEM-004 for each source)
   b. Number of Stacks Venting Source Operation (s): 1
4. Distance to the nearest Property Line (ft.): 160
5. Stack Diameter (inches): 36
6. Discharge Height Above Ground (ft.): 50
7. Exit Temperature of Stack Gases (°F): 400
8. Volume of Gas Discharged at Stack Conditions (A.C.F.M.): 16,000
9. Discharge Direction: ☐ Horizontal ☒ Up ☐ Down

The information supplied on applications VEM-003 and VEM-004, including the data in supplements, is to the best of my knowledge true and correct.

William S. Turetsky
Signature

December 17, 1982
Date

William S. Turetsky
Name (Print or type)

Director Safety & Environmental Protectic
Title

This application will not be processed unless proper fee is submitted.

FOR ASSISTANCE CALL (609) 292-6716

FOR DEPARTMENT USE ONLY

☐☐☐☐☐ - ☐☐☐ - 000   025354

(over)

Form VEM-004
1/79

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

Source Emissions And Source Data Form

(Complete this form for each source and submit with application Form VEM-003)

SECTION E

SOURCE INFORMATION

1. Source Description: Boiler No. 5

2. Operating Schedule

Hours/Day	Hours/Year	Operation Starting Date
24	8760	1956

3. % Annual Production Throughput By Quarter

Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.
25	25	25	25

4. Volume Of Gas Discharged From This Source (ACFM): 16,000 Source Discharge Temperature (^{0}F): 400

SECTION F

CONTROL APPARATUS ON SOURCE

		Capital Cost (Dollars)	Annual Operating Cost (Dollars)	No. of Sources Connected
Primary	None	N/A	N/A	1
Secondary				
Tertiary				

SECTION G

AIR CONTAMINANTS FROM SOURCE

CONTAMINANT NAME	Emissions w/o Control (lbs./hr.)	Emissions with Control (lbs./hr.)	How Determined
Sulfur Dioxide	4.5		Stack Test
Carbon Monoxide	< 0.5		AP-42
Nitrogen Oxides	4		Stack Test
Hydrocarbons	0.5		Stack Test
Particulates	2		Stack Test

TO INSURE PROPER COORDINATION BETWEEN VEM- 003 AND VEM- 004 FORMS, INSERT IDENTICAL COMPANY NAME AN[illegible] DESIGNATION OF STACK FROM VEM- 003, SIDE 1.

Full Business Name: GIVAUDAN CORPORATION

Company Designation of Stack (s): Boiler No. 5

(over)

SECTION H

A. MANUFACTURING AND MATERIALS HANDLING

1. Process Description ____________________

2. Total Amount Materials Processed ☐ Batch ________ lb/batch, ________ hr/batch ☐ Continuous ________ lb/hr

3. Raw Materials

Raw Materials	% By Wt.	Raw Materials	% By Wt.

B. FUEL BURNING EQUIPMENT

1. Gross Heat Input (10^6 BTU/HR) 30

2. Type Heat Exchange ☒ Direct ☐ Indirect ☐ Internal Combustion Engine

	PRIMARY FUEL	SECONDARY FUEL
3. a. Type of Fuel:	Residual Oil	Non-commercial fuel
b. Heating Value (Btu/lb):	18,900	16,000
4. Method of Firing:	2 Burner Nozzles	1 Burner Nozzle
5. % Sulfur in Fuel (Dry):	0.29	Nil
6. % Ash Content of Fuel (Dry):	0.1 Max.	0.9
7. Amount Burned/Yr.	< 1,000 (10^3 gallons)	< 150 (10^3 gallons)

Units: Solid Fuel (Tons) Liquid Fuel (10^3 Gal.) Gaseous Fuel (10^6 Ft.^{3})

C. INCINERATION

1. Type of Unit ____________________

2. Constituents of Waste (s) ____________________

3. Waste Code ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6

4. Amount Burned (lbs./hr.) ________ Type of Auxil. Fuel (If Any) ________

D. STORAGE FACILITY

1. Tank Contents ____________________

2. Type of Tank or Bin ________ Height or Length (Ft.) ________

3. Capacity ________ (10^3 Ft.^{3}) ☐ (10^3 Gal.) ☐ Equivalent or Actual Diameter (Ft.) ________

THE REMAINING QUESTIONS ARE TO BE ANSWERED ONLY FOR LIQUID STORAGE

4. Vapor Pressure at 70°F (PSIA) ________ Storage Temp. If Not Ambient (°F) ________

5. Filling Rate (Gal/Min) ________ Annual Throughput (10^3 Gal/Yr) ________

6. Method of Fill ☐ Top ☐ Bottom ☐ Submerged ☐ Other (Explain Below)

7. Color of Tank ☐ White ☐ Other Exposed to Suns Rays ☐Yes ☐No

8. Insulation Data for Insulated Tanks (Volatile Organic Substances)
 Type ________, Thickness (Inches) ________, Thermal Conductivity (BTU/HR/FT^2/°F) ________

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Form VEM-003
1/79

Side 1

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

RECEIVED
DEC 22 10 18 AM '82
N.J. STATE DEPT. OF
ENV. PROTECTION
DIV. OF ENV. QUALITY

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

TO: New Jersey Department of Environmental Protection
Bureau of Air Pollution Control
CN- 027
Trenton, New Jersey 08625

Read Instructions Before Completing Application

SECTION A

1. Full Business Name: GIVAUDAN CORPORATION
2. Mailing Address: 125 (No.) Delawanna Avenue (Street) Clifton, (City) N.J. (State) 07014 (Zip Code)
3. Division and/or Plant Name: -Same-
4. Plant Location: -Same- (No.) (Street) (Municipality) (County)
5. Location of equipment on premises (Bldg., Dept., area, etc.): Building 7
6. Nature of business: Aromatic Chemicals
7. Estimated starting date of construction: Existing Boiler No. 4
8. Date equipment to be put in use: N/A
9. Plant Contact: William S. Turetsky, Director Safety & Environ. Protect. (201) 365-852
Name (Print or type) Title Telephone No.

SECTION B

REASON FOR APPLICATION (CHECK ONE)

- ☐ New Equipment without Control Apparatus
- ☐ New Equipment with Control Apparatus
- ☐ New Control Apparatus on Existing Equipment
- ☐ Five Year Renewal of Certificate No. (s)
- ☒ Other (Explain) Grandfathered boiler requiring Air Permit under Hazardous Waste Regu
- ☐ Modification to Existing Equipment
- ☐ Modification to Existing Control Apparatus
- ☐ Painting Tank White

SECTION C

STACK INFORMATION (EQUIVALENT STACK INFORMATION)

1. Company Designation of Stack (s): No. 4 Boiler Stack
2. Previous Certificate Numbers (if any): None
3. a. Number of Sources Venting to this Stack: 2 (Complete a separate VEM-004 for each source)
   b. Number of Stacks Venting Source Operation (s): 1
4. Distance to the nearest Property Line (ft.): 160
5. Stack Diameter (inches): 60
6. Discharge Height Above Ground (ft.): 135
7. Exit Temperature of Stack Gases (°F): 400
8. Volume of Gas Discharged at Stack Conditions (A.C.F.M.): 32,000
9. Discharge Direction: ☐ Horizontal ☒ Up ☐ Down

The information supplied on applications VEM-003 and VEM-004, including the data in supplements, is to the best of my knowledge true and correct.

William S. Turetsky
Signature

December 15, 1982
Date

William S. Turetsky
Name (Print or type)

Director Safety & Environmental Protec
Title

This application will not be processed unless proper fee is submitted.

FOR ASSISTANCE CALL (609) 292-6716

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Form VEM-004
1/79

Side

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

Source Emissions And Source Data Form

(Complete this form for each source and submit with application Form VEM-003)

SECTION E

SOURCE INFORMATION

1. Source Description: Boiler No. 4
2. Operating Schedule: 24 Hours/Day; 8760 Hours/Year; 1947 Operation Starting Date
3. % Annual Production Throughput By Quarter: 25 Jan.-Mar.; 25 Apr.-June; 25 July-Sept.; 25 Oct.-Dec.
4. Volume Of Gas Discharged From This Source (ACFM): 16,000; Source Discharge Temperature (^{o}F): 400

SECTION F

CONTROL APPARATUS ON SOURCE

		Capital Cost (Dollars)	Annual Operating Cost (Dollars)	No. of Sources Connected
Primary	None	N/A	N/A	2
Secondary				
Tertiary				

SECTION G

AIR CONTAMINANTS FROM SOURCE

CONTAMINANT NAME	Emissions w/o Control (lbs./hr.)	Emissions with Control (lbs./hr.)	How Determined
Sulfur Dioxide	4.5		Stack Test
Carbon Monoxide	< 0.5		AP-42
Nitrogen Oxides	4		Stack Test
Hydrocarbons	< 0.5		Stack Test
Particulates	2		Stack Test

TO INSURE PROPER COORDINATION BETWEEN VEM- 003 AND VEM- 004 FORMS, INSERT IDENTICAL COMPANY NAME AN DESIGNATION OF STACK FROM VEM- 003, SIDE 1.

Full Business Name: GIVAUDAN CORPORATION

Company Designation of Stack (s): Boiler No. 4

(over)

SECTION H

A. MANUFACTURING AND MATERIALS HANDLING

1. Process Description ____________________

2. Total Amount. Materials Processed ☐ Batch ________ lb/batch, ________ hr/batch ☐ Continuous ________ lb/hr

3. Raw Materials % By Wt. Raw Materials % By Wt.

B. FUEL BURNING EQUIPMENT

1. Gross Heat Input (10^6 BTU/HR) 30

2. Type Heat Exchange ☒ Direct ☐ Indirect ☐ Internal Combustion Engine

	PRIMARY FUEL	SECONDARY FUEL
3. a. Type of Fuel:	Residual Oil	Non-commercial fuel
b. Heating Value (Btu/lb):	18,900	16,000
4. Method of Firing:	2 Burner Nozzles	1 Burner Nozzle
5. % Sulfur in Fuel (Dry):	0.29	Nil
6. % Ash Content of Fuel (Dry):	0.1 Max.	0.9
7. Amount Burned/Yr.	< 1,000 (10^3 gallons)	< 150 (10^3 gallons)

Units: Solid Fuel (Tons) Liquid Fuel (10^3 Gal.) Gaseous Fuel (10^6 Ft.^{3})

C. INCINERATION

1. Type of Unit ____________________

2. Constituents of Waste (s) ____________________

3. Waste Code ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6

4. Amount Burned (lbs./hr.) ________ Type of Auxil. Fuel (If Any) ________

D. STORAGE FACILITY

1. Tank Contents ____________________

2. Type of Tank or Bin ________ Height or Length (Ft.) ________

3. Capacity ________ (10^3 Ft.^{3}) ☐ (10^3 Gal.) ☐ Equivalent or Actual Diameter (Ft.) ________

THE REMAINING QUESTIONS ARE TO BE ANSWERED ONLY FOR LIQUID STORAGE

4. Vapor Pressure at 70°F (PSIA) ________ Storage Temp. If Not Ambient (°F) ________

5. Filling Rate (Gal/Min) ________ Annual Throughput (10^3 Gal/Yr) ________

6. Method of Fill ☐ Top ☐ Bottom ☐ Submerged ☐ Other (Explain Below)

7. Color of Tank ☐ White ☐ Other Exposed to Suns Rays ☐Yes ☐No

8. Insulation Data for Insulated Tanks (Volatile Organic Substances)
   Type ________, Thickness (Inches) ________, Thermal Conductivity (BTU/HR/FT^2/°F) ________

For Department Use Only

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Quality

SOURCE DATA SHEET - BOILERS BURNING LIQUID WASTE

1) Burning Rate of Waste (lb/hr) 900# - 1,000#/hr./Boiler
2) Density of Waste (lb/gal) 6# to 8#/gal.
3) Net heating value of waste (BTU/lb) 16,000 to 18,000 BTU/lb.
4) Boiler Type - Model etc..... #4 Babcock & Wilcox - BH9033 - Oil Burning Steam #F1212
   #5 Wickes Boiler Co. - BH-1 Oil Burning Steam #D3784
5) Boiler Capacity (10^6BTU/hr) 35-40 x 10^6 BTU/hr.
6) Burning Rate of the commercial fuel (lb/hr) 1600-3400 lb./hr.
7) Temperature in Fire Box 1,850° to 2,100°F
8) Residence time (sec)-at above temperature 5-6 seconds
9) What is the minimum destruction efficiency of hydrocarbons 99.9009
10) Principal organic hazard components See Attachment No. 1
   Is the burning device located in an area zoned for industrial use? X Yes ___ No
11) Include the emissions in lb/hr of all possible contaminants (including CO_2 & H_2O). Attachment No. 2.
12) Provide a listing of each specific waste, and the composition of each waste. Attachment No. 3
13) Explain what record-keeping procedures are used to monitor the waste burned. Attachment No. 4.
14) Describe how the waste feed rate will be continuously monitored. Will flow meters be used? Will waste fuel be fed on a batch basis?
   Attachment No. 5
15) Explain how the waste is generated. Show unit operations and include flow diagrams. On site generated. Attachment No. 6
16) Demonstrate that the device has a minimum combustion efficiency of at least 99.9% as determined by the following formula where Carbon Dioxide (CO_2) and Carbon Monoxide (CO) are measured in concentration by volume:

   Combustion Efficiency = $CO_2/(CO_2+CO) \times 100\%$ Attachment No. 7
17) You are required to continuously monitor O_2 and either CO or total Hydrocarbons. Please submit details on the sampling equipment, sampling procedures and sampling locations. Attachment No. 8
18) You are required to have a full time operator present when the waste is burned. The engineer-in-charge must possess, 1-C "Blue Seal" third class engineers license. Please send copy of his license. Attachment No. ___

Attachment No.1

Question NO. 10)

Principal Organic Hazard Components

Recovered solvents, off spec products and still bottoms of aldehydes, alcohols, esters, ketones, hydrocarbons and other organic chemicals and their decomposition products.

Attachment No. 2

Question No. 11)

Contaminant Name	Emissions w/o Controls (lbs/hr)	How Determined
Sulfur Dioxide	4.5	Stack Test
Carbon Monoxide	0.5	AP-2
Nitrogen Oxides	4	Stack Test
Hydrocarbons	0.5	Stack Test
Particulates	2	Stack Test
Carbon Dioxide	10%	Orstat Test
Water	Unknown	

Attachment No. 3

Question No. 12

WASTE PRODUCT RECORD
Waste Description (at 70°F)

PHYSICAL PROPERTIES OF THE WASTE:

Physical state at 70°F: SOLID SEMI-SOLID [LIQUID] OTHER: ____________

Viscosity at 70°F: [LOW] MEDIUM HIGH

Flash Point: below 140°F Closed Cup Open Cup

pH Range: 1-3 3-5 5-7 [8-9] 9-11 11-13 N.A.

Layering (for liquids only): [NONE] MULTILAYERED BILAYERED

Specific Weight: .8000 to 9250 (as # per unit).

Vapor Pressure: Unknown (for liquids only; in mm Hg at 70°F)

BTU/LB : 13,500

ASH CONTENT @650°C : .3 to 1

CHLORINE BY WEIGHT(%): O-TRACE OR Trace %

SULFUR BY WEIGHT(%) : O-TRACE OR None %

CHEMICAL COMPOSITION

Component

The following materials, but not limited to, recovered solvents, off specification organic materials and still bottoms of aromatic and aliphatic aldehydes, alcohols, esters, ketones, hydrocarbons, and/or their decomposition products can be present in varying amounts acetone, butyl alcohol, cyclohexane, ethyl acetate, ethyl, methyl, isopropyl alcohols, heptante, hexane, isobutanol, isopropyl acetate, methyl ethyl ketone, toluene, acetanisole, acetates C8 to C12, aldehydes C7 to C18, allyl caproate, amyl benzoate, substituted alcohols, aldehydes and acetates, alcohols C7 to C12, aromatic alcohols, aldehydes and acetates, xylene, dimethyl butane, propylene, isobutane and other materials used by the flavor and fragrance industries.

Attachment No. 4

Question No. 13

Waste Recordkeeping - Monitoring Procedure

Incoming Material

1. Specific Organic: By Gas Chromotography
2. Halogen Content: Flame test, modified from National formulary, Eleventh Edition, pg. 46

Blend (Fuel) Waste

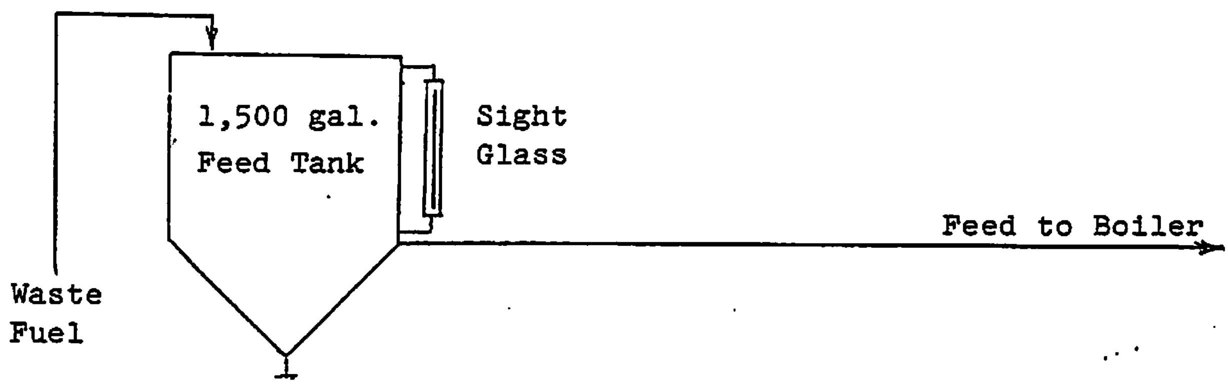
1. Acid Value: By Titration
2. Moisture Content: By Carl Fisher method.
3. Ash Content: Residue on Ignition - from U.S. pharmacopeia, 16th Revision, page 907
4. Halogen Content: Flame Test - modified from National Formulary, Eleventh Edition, pg. 46

All lab analysis records are maintained on-site.

Attachment No. 5

Question No. 14)

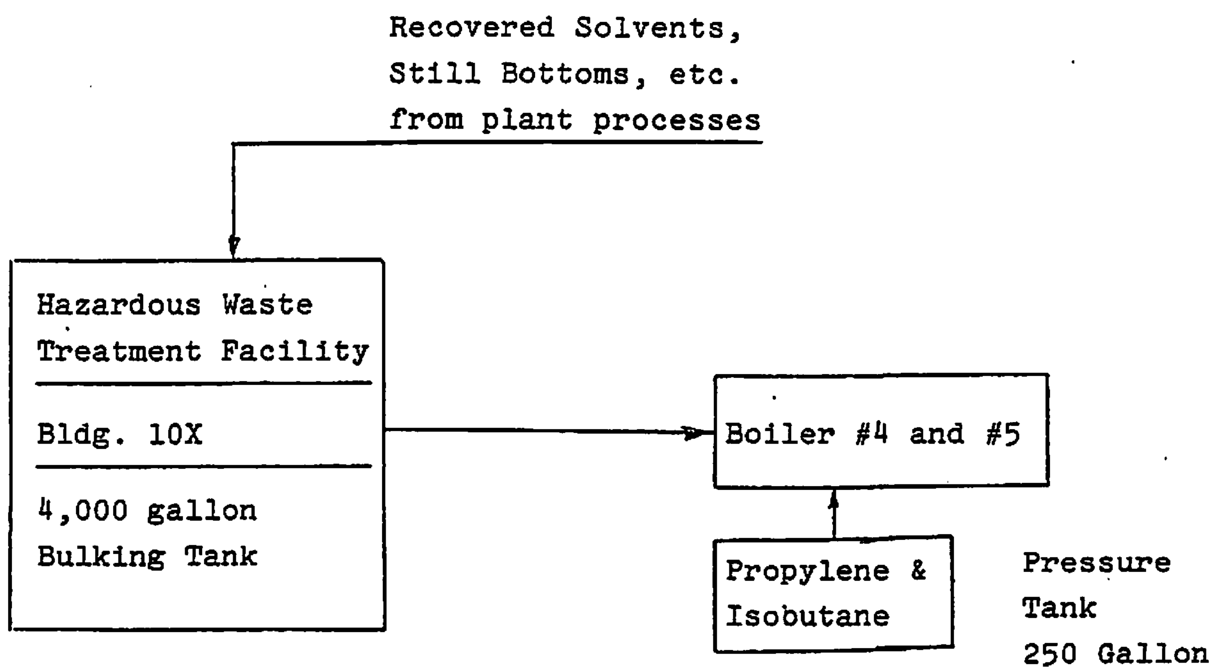
There are no flowmeters and the waste fuel will be fed on a batch basis.



Boilers No. 4 & 5 have 3 nozzles each. Two are on Commercial Fuel and one is on Waste Fuel. It takes 10 to 15 hours to feed in the 1,500 gallons of waste fuel.

Attachment No. 6

Question No. 15)



Attachment No. 7

Orstat Test showed Carbon Dioxide (CO_2) reading registered 11%.

CO_2 range is 9 to 13% by volume

Combustion Efficiency = $CO_2/CO_2 + CO \times 100\%$

(CO percent at 9% CO_2

$$99.9 = 9/9 = CO \times 100\%$$

$$99.9\ (9 + CO) = 900$$

$$899.1 + 99.9\ CO = 900$$

$$99.9\ CO = 900 - 899.1$$

$$CO = .9/99.9$$

$$CO = .009009\%$$

(CO percent at 13% CO_2)

$$99.9 = 13/13 + CO \times 100$$

$$99.9\ (13 + CO) = 1300$$

$$1298.7 + 99.9\ (\%\ CO) = 1300$$

$$CO = 1.3/99.9$$

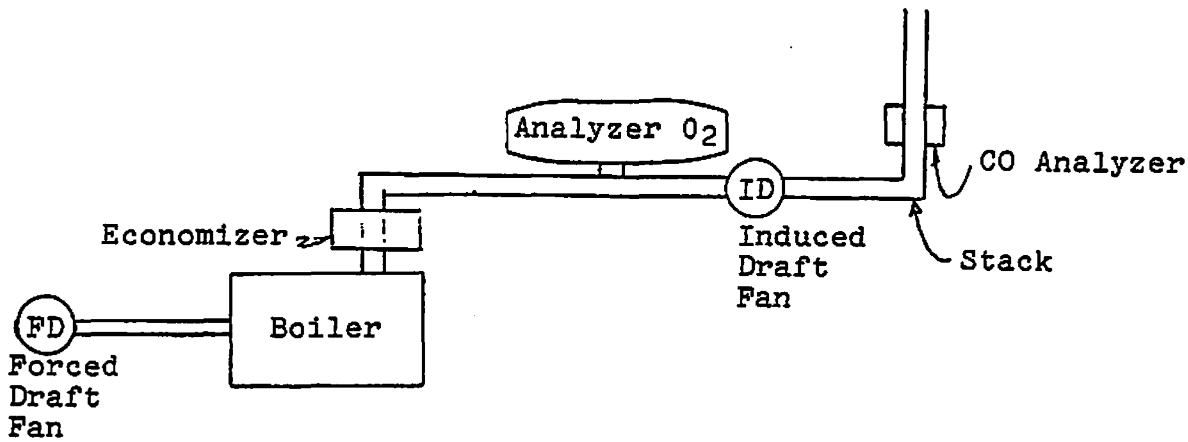
$$CO = .013013\%$$

Limit 9% CO_2 = 90 ppm or .009%

Limit 13% CO_2 = 130 ppm or .013%

Attachment No. 8

Question No. 17)

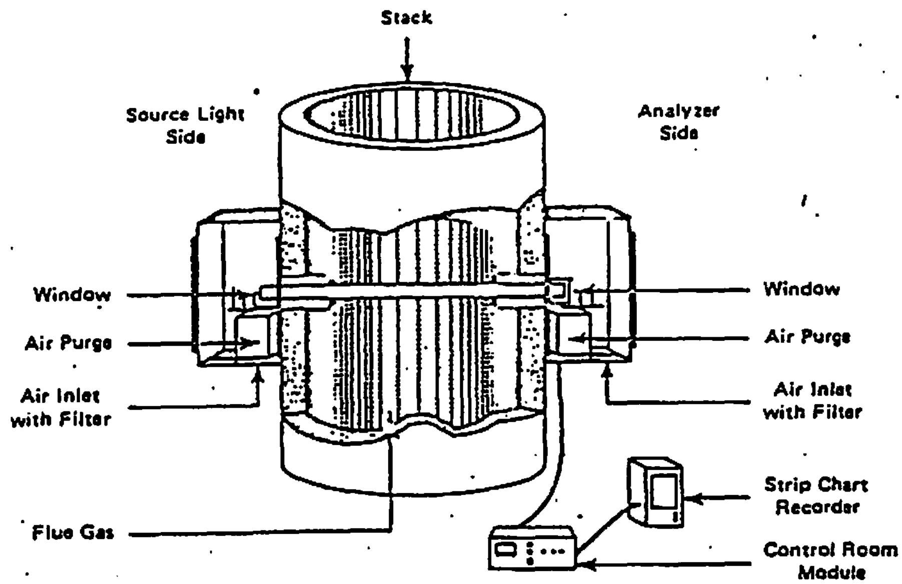


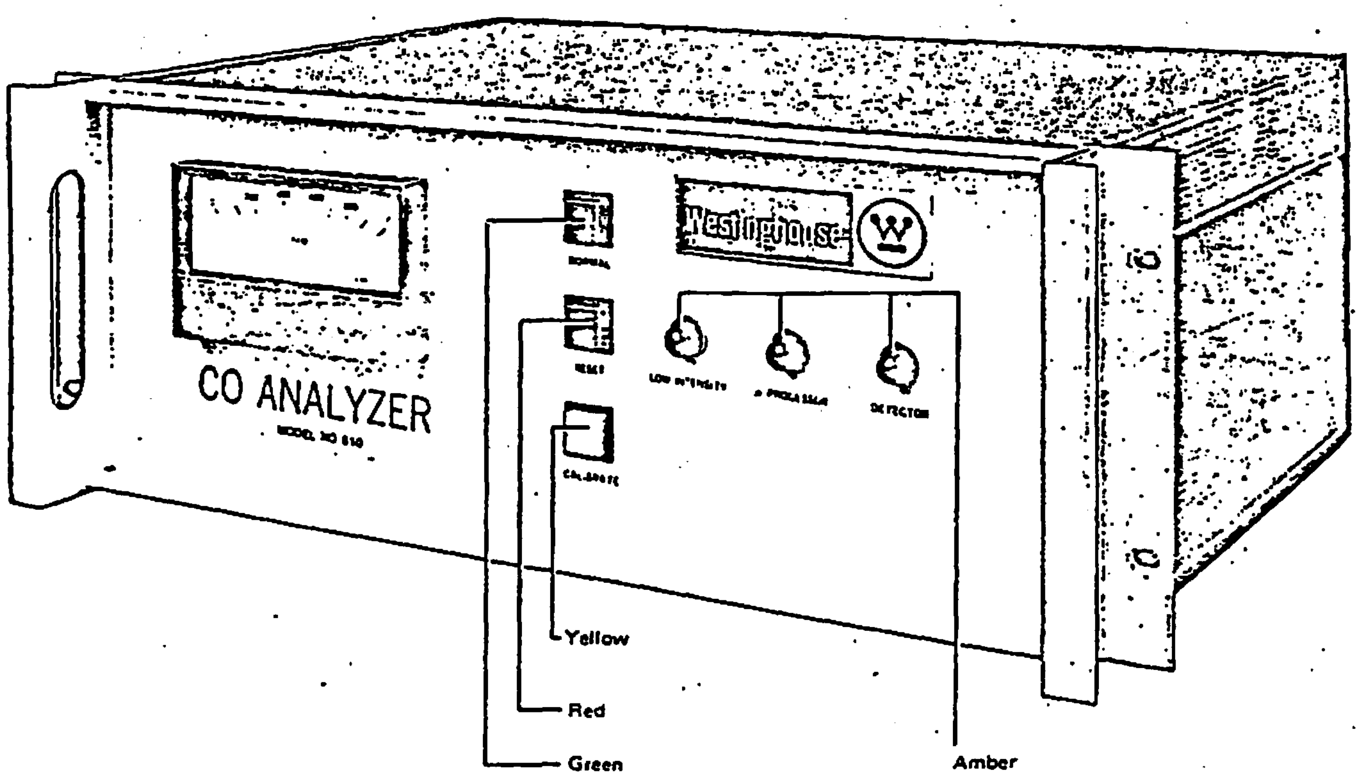
Pictured above is the O_2 and CO analyzers location in boiler.

O_2 is Westinghouse Zerconium Unit

CO is Princeton Research Infra Red Unit

ATTACHMENT 8





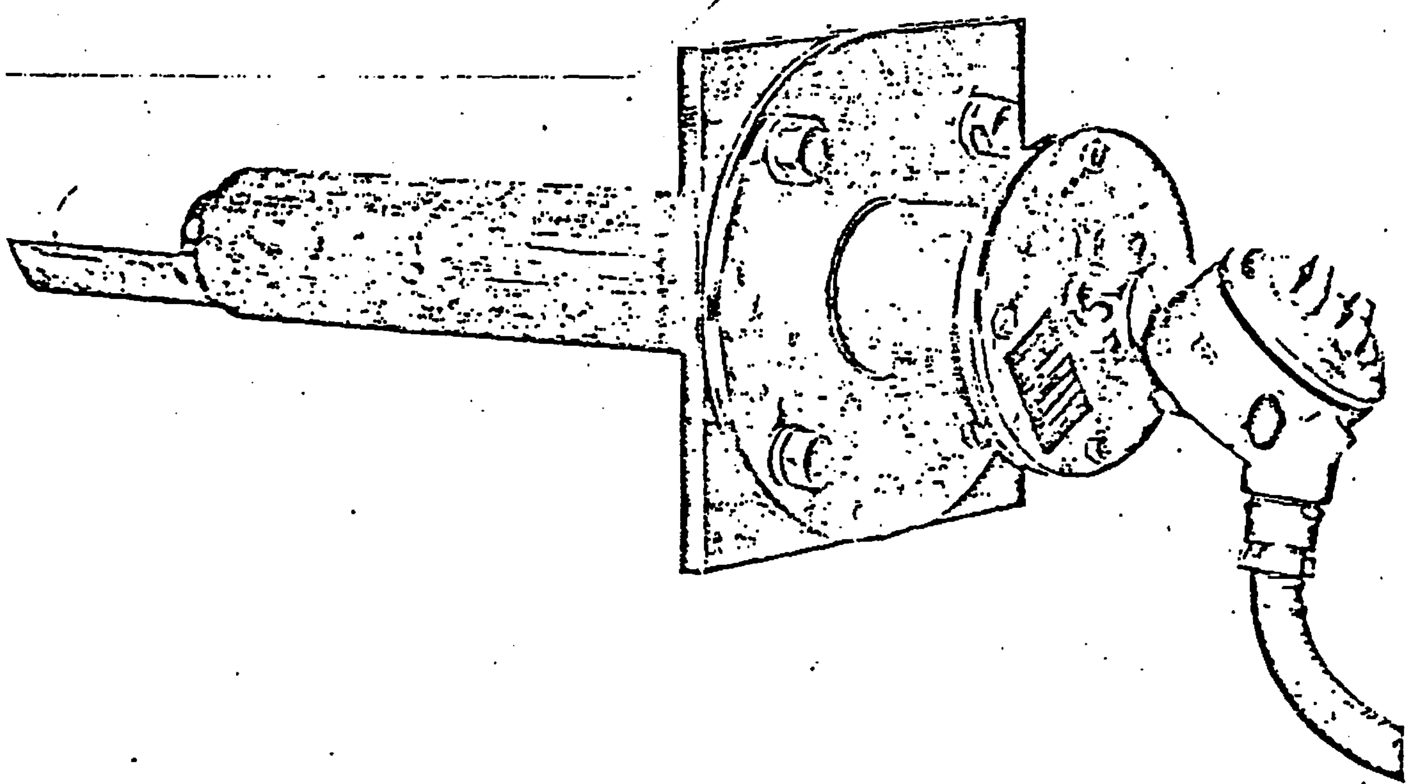
Westinghouse Electric Corporation
Computer & Instrumentation Division
Orrville, Ohio, U S.A. 44667

I.B. 106 101
Instruction Bulletin

February, 1981
Supersedes I.B. 106-101 Dated
March, 1978 and I.B. 106-102
Dated June, 1979

Hagan Model 218

Probe Type Oxygen Analyzer Package



SYSTEM OVERVIEW
MODEL 218 PROBE-TYPE OXYGEN SENSING SYSTEM

GENERAL

The Westinghouse Probe-Type Oxygen Analyzer is a heavy duty industrial package designed to measure the net concentration of oxygen in an industrial process; i.e., the oxygen remaining after all fuels have been oxidized. It performs this task without the use of a sampling system.

The equipment measures oxygen percentage by reading the voltage developed across a heated electrochemical cell which consists of a small yttria-stabilized, zirconia disc. Both sides of the disc are coated with porous metal electrodes. When operated at the proper temperature (maintained by a Temperature Controller), the millivolt output voltage of the cell is given by the following Nernst equation:

$$EMF = KT \log_{10} \frac{P1}{P2} + C$$

Where: P2 is the partial pressure of the oxygen in the measured gas on one side of the cell, and P1 is the partial pressure of the oxygen in the reference gas on the other side. Normal air from a clean, dry, instrument air supply (20.95 % oxygen) is used as the reference gas. T is the absolute temperature; C is the cell constant, and K is an arithmetic constant.

When the cell is at operating temperature and there are unequal oxygen concentrations across the cell, oxygen ions will travel from the high partial pressure of oxygen to the low partial pressure side of the cell. The resulting logarithmic output voltage is approximately 53 mV per decade. Because the magnitude of the output signal is proportional to the logarithm of the inverse of the sample oxygen partial pressure, the output signal increases as the oxygen concentration of the sample gas decreases. This characteristic enables the analyzer to provide exceptional sensitivity at low oxygen concentrations.

The Model 218 Probe-Type Oxygen Sensing Equipment measures net oxygen concentration in the presence of all the products of combustion, including water. It may therefore be considered as an analysis on a "wet" basis. In comparison with older methods, such as the Orsat apparatus, which provides an analysis on a "dry" gas basis, the "wet" analysis will, in general, indicate a lower percentage of oxygen. The difference will be proportional to the water content of the sampled gas stream.

System Configuration

At the end of this section on page 9 is a fold-out diagram illustrating an overview of the possible Westinghouse Oxygen Analyzer Systems referred to in this instruction book. Since many references in this section will be made to this diagram, the page should be unfolded and used as a reference as you continue through the Instruction Book.

Figure 1 on the following page lists the various Westinghouse part numbers for available oxygen analyzer systems as well as the reference item numbers in Figure 12 for the elements making up a system. By referring to the Shipping & Receiving documents or the customer copy of the Westinghouse Shop Order, identifying the individual components in your system and locating them on the Figure 1 table, you will see how your system's components work together as a fully operational system.

The Sensor

Items 1 and 2 in Figure 12 illustrate the oxygen probe. The probe is the sensor element in the Westinghouse Oxygen Analyzer System. The probe fits directly into the process gas stream, thus no sampling system is required.

It measures the net concentration, developing a voltage which is a function of this concentration. Probes are available in five lengths (18 inch, 3, 6, 9, and 12 ft.). The probe unit is equipped with a ceramic filter and heat shield and is also available with a flame arrestor that meets Factory Mutual (F.M.) approval.

A probe is also available for use with the 2 Point Calibrator, which provides an automatic calibration check every 24 hours. This option also provides remote calibration check on command. Item 2 in Figure 12 represents this version of the probe.

A detailed description of the standard probe construction is given on page 5 with installation instructions on page 11 and service and trouble shooting on page 24.

The Electronics Package

The electronics package is a field mounted housing or housings containing the Probe Temperature Controller, power supply and amplifier.

The Temperature Controller maintains the temperature of the oxygen sensing cell at a constant 1550 degrees F (843 degrees C) by modulating the duty cycle of the 115V heater in the probe. The temperature controller is an electronic printed circuit board and is enclosed in either a NEMA 12 or a hazardous area type enclosure.

The power supply for the temperature controller requires a second printed circuit card which is always housed with the Temperature Controller.

The amplifier accepts the millivolt signal generated by the sensing cell in the probe and produces a standard 4-20 ma. current signal to be used with remotely connected devices. Normally this amplifier is integrally mounted on the same printed circuit card as the power supply. Thus the two cards, the Temperature Controller and power supply/amplifier cards, represent a complete electronic package. The amplifier is either logarithmic or linear with the linear version available with either non-isolated or isolated input/output. Items 3, 5 and 7 in Figure 12 illustrate the three available packages for this standard two-card configuration.

Item 3 represents the NEMA package, Item 5 is the Hazardous Area package and Item 7 is the NEMA Two-Point Calibrator package.

When special system needs require exceptional radio frequency interference protection, the amplifier function is omitted from the basic two-card package and the amplifier function is performed by a separate amplifier and its 24 volt power supply. Items 4, 6 and 8 in Figure 12 represent the NEMA, Hazardous Area, and Two-Point Calibrator packages containing the Temperature Controller and power supply only cards. Items 9 and 10 are the remote amplifier with isolation and RFI protection and its 24V power supply.

Regardless of which electronic package is selected, a 4-20 ma current signal is produced for use with the available computer, control, or display elements.

A detailed description of all the electronic packages is given on page 7, installation instructions are on page 12 and service and troubleshooting are on page 24.

Because of the special nature of the Two-Point Calibrator packages (Items 7 and 8 Figure 12), and the additional functions performed by the package, a separate instruction bulletin (IB 106-103) describes these packages in full detail.

Computer Elements

The probe sensor and electronics package produce a signal proportional to the logarithm of the inverse of the sample oxygen partial pressure. It is often desirable, however, to obtain a signal linearly proportional to oxygen. Such a linear signal is necessary when two or more sensor element signals are to be averaged in order to obtain a more representative reading over large duct cross sections or when the measurement signal is to be used in a closed loop control system where constant loop gain is desirable.

The VERITRAK inverse analog generator module (Item 11 Figure 12) and the 24V power supply (Item 10, Figure 12) provides the linearizer function when required. A description of this element along with installation and service instructions is included in the Instruction Bulletin IB-101-806.

When several probes are used in the same duct and an average value is required, an averaging module (Item 12, Figure 12) is required. This module accepts up to six linearized oxygen signals and produces a single output. A description of this element along with installation and service instructions is included in Instruction Bulletin IB-SP-1872.

Display Functions

A number of recorders, recorder/controllers or indicators (Item 13, Figure 12) are available for use with the Westinghouse Oxygen Analyzer systems. These components accept the 4-20 ma signal from the amplifier, linearizer or averager to indicate, record or control the oxygen value.

Recorders include a round chart model which provides a 24-hour record on a single chart (See IB-105-003), an Optimac Recorder with horizontal scale and vertical paper travel (See IB-104-601) or a VERITRAK strip chart recorder controller with vertical scale. Indicators can include vertical voltmeters (IB-104-602), Servo-driven indicators (IB-101-435) or solid state, all-electronic analog displays.

Attachment No. 9

Question No. 18)

Audit Nº 144227

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-42203 Expiration Date 6-30-84

Classification-Grade 1-C Issue No. 15-16-17

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name GILBERT P. MEAD

Address 65 EDISON AVENUE
NUTLEY, NJ 07110

Signature Gilbert P. Mead

This identification card should be posted with License. Signed original must be returned for renewal.

Audit No. 157630

State of New Jersey
Department of Labor
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625-0392

MI-2 (R-2-82)

IDENTIFICATION CARD

License No. A-34918 Expiration Date 11-30-85

Classification-Grade 1-2-C Issue No. 31-32-33

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name JOHN KALINOWSKI

Address 12 LANZA AVENUE
GARFIELD, NJ 07026

Signature John Kalinowski

This identification card should be posted with License. Signed original must be returned for renewal.

Audit Nº 137787

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-49360 Expiration Date 2-28-84

Classification-Grade 1-C Issue No. 2-3-4

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name TIMOTHY G. FREY

Address 50 LAMBERT ST.
CLIFTON, NJ 07013

Signature Timothy G. Frey

This identification card should be posted with License. Signed original must be returned for renewal.

Audit Nº 137533

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-36518 Expiration Date 3-31-84

Classification-Grade 1-C Issue No. 26-27-28

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name JOSEPH KLUCZNIK

Address 26 CUTLER STREET
CLIFTON, NJ 07011

Signature Joseph Klucznik

This identification card should be posted with License. Signed original must be returned for renewal.

Audit No. 160032

State of New Jersey
Department of Labor
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625 0392

MI-2 (R-2-82)

IDENTIFICATION CARD

License No. A-43112 Expiration Date 1-31-86

Classification-Grade 1-C (REF. SPEC.) Issue No. 14-15-16

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name RUSSELL J. HELSENS

Address 12 IRVINGTON PLACE
CLIFTON, NJ 07013

Signature Russell J. Helsens

This identification card should be posted with License. Signed original must be returned for renewal.

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

Hal: For your info JTA

March 27, 1984

Mr. T. Micai
Assistant Supervisor
Permits and Certification
N.J. Department of Environmental Protection
Bureau of Air Pollution Control
CN-027
Trenton, New Jersey 08625

Dear Mr. Micai:

Re: Submittal of Supplementary Information
Air Certificate Tracking No. 825353 & 825354
Boilers No. 4 and 5

As per your request, the questionnaire regarding our Boiler #4 and #5 waste fuel boiler and the hazardous waste boiler exemption [N.J.A.C. 7:26-12.1(b)(7)] is enclosed.

If you have any questions concerning this submittal, please contact me at (201) 365-8486.

Sincerely,

GIVAUDAN CORPORATION

John T. Angiolini

John T. Angiolini
Assistant Director
Environmental Affairs

JTA:lk
Enclsoures

Form VEM-003
1/79

Side 1

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

RECEIVED
DEC 22 12 18 AM '82
N.J. ST. DEPT. OF ENV. PROTECTION
DIV. OF ENV. QUALITY

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

TO: New Jersey Department of Environmental Protection
Bureau of Air Pollution Control
CN-027
Trenton, New Jersey 08625

Read Instructions Before Completing Application

SECTION A

1. Full Business Name GIVAUDAN CORPORATION
2. Mailing Address 125 Delawanna Avenue Clifton, N.J. 07014
(No.) (Street) (City) (State) (Zip Code)
3. Division and/or Plant Name -Same-
4. Plant Location -Same-
(No.) (Street) (Municipality) (County)
5. Location of equipment on premises ((Bldg., Dept., area, etc.) Building 7
6. Nature of business Areomatic Chemicals
7. Estimated starting date of construction Existing Boiler No. 5
8. Date equipment to be put in use N/A
9. Plant Contact William S. Turetsky, Director Safety & Environ. Protect. (201) 365-8527
Name (Print or type) Title Telephone No.

SECTION B

REASON FOR APPLICATION (CHECK ONE)

- ☐ New Equipment without Control Apparatus
- ☐ New Equipment with Control Apparatus
- ☐ New Control Apparatus on Existing Equipment
- ☐ Five Year Renewal of Certificate No. (s)
- ☒ Other (Explain) Grandfathered Boiler requiring Air Permit under Hazardous Waste Regulti
- ☐ Modification to Existing Equipment
- ☐ Modification to Existing Control Apparatus
- ☐ Painting Tank White

SECTION C

STACK INFORMATION (EQUIVALENT STACK INFORMATION)

1. Company Designation of Stack (s) No. 5 Boiler Stack
2. Previous Certificate Numbers (if any) None
3. a. Number of Sources Venting to this Stack 1 (Complete a separate VEM-004 for each source)
   b. Number of Stacks Venting Source Operation (s). 1
4. Distance to the nearest Property Line (ft.) 160
5. Stack Diameter (inches) 36
6. Discharge Height Above Ground (ft.) 50
7. Exit Temperature of Stack Gases (°F) 400
8. Volume of Gas Discharged at Stack Conditions (A.C.F.M.) 16,000
9. Discharge Direction ☐ Horizontal ☒ Up ☐ Down

The information supplied on applications VEM-003 and VEM-004, including the data in supplements, is to the best of my knowledge true and correct.

William S. Turetsky
Signature

December 17, 1982
Date

William S. Turetsky
Name (Print or type)

Director Safety & Environmental Protectic
Title

This application will not be processed unless proper fee is submitted.

FOR ASSISTANCE CALL (609) 292-6716

FOR DEPARTMENT USE ONLY

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(over)

Form VEM-004
1/79

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

Source Emissions And Source Data Form
(Complete this form for each source and submit with application Form VEM-003)

SECTION E

SOURCE INFORMATION

1. Source Description: Boiler No. 5
2. Operating Schedule: 24 Hours/Day; 8760 Hours/Year; 1956 Operation Starting Date
3. % Annual Production Throughput By Quarter: 25 Jan.-Mar.; 25 Apr.-June; 25 July-Sept.; 25 Oct.-Dec.
4. Volume Of Gas Discharged From This Source (ACFM): 16,000 — Source Discharge Temperature (^{o}F): 400

SECTION F

CONTROL APPARATUS ON SOURCE

		Capital Cost (Dollars)	Annual Operating Cost (Dollars)	No. of Sources Connected
Primary	None	N/A	N/A	1
Secondary				
Tertiary				

SECTION G

AIR CONTAMINANTS FROM SOURCE

CONTAMINANT NAME	Emissions w/o Control (lbs./hr.)	Emissions with Control (lbs./hr.)	How Determined
Sulfur Dioxide	4.5		Stack Test
Carbon Monoxide	< 0.5		AP-42
Nitrogen Oxides	4		Stack Test
Hydrocarbons	0.5		Stack Test
Particulates	2		Stack Test

TO INSURE PROPER COORDINATION BETWEEN VEM-003 AND VEM-004 FORMS, INSERT IDENTICAL COMPANY NAME AND DESIGNATION OF STACK FROM VEM-003, SIDE 1.

Full Business Name: GIVAUDAN CORPORATION

Company Designation of Stack (s): Boiler No. 5

(over)

SECTION H

A. MANUFACTURING AND MATERIALS HANDLING

1. Process Description ______
2. Total Amount. ☐ Batch ______ lb/batch, ______ hr/batch
   Materials Processed ☐ Continuous ______ lb/hr
3. Raw Materials % By Wt. | Raw Materials % By Wt.

B. FUEL BURNING EQUIPMENT

1. Gross Heat Input (10^6 BTU/HR) 30
2. Type Heat Exchange ☒ Direct ☐ Indirect ☐ Internal Combustion Engine

	PRIMARY FUEL	SECONDARY FUEL
3. a. Type of Fuel:	Residual Oil	Non-commercial fuel
b. Heating Value (Btu/lb):	18,900	16,000
4. Method of Firing:	2 Burner Nozzles	1 Burner Nozzle
5. % Sulfur In Fuel (Dry):	0.29	Nil
6. % Ash Content of Fuel (Dry):	0.1 Max.	0.9
7. Amount Burned/Yr.	< 1,000 (10^3 gallons)	< 150 (10^3 gallons)

Units: Solid Fuel (Tons) Liquid Fuel (10^3 Gal.) Gaseous Fuel (10^6 $Ft.^3$)

C. INCINERATION

1. Type of Unit ______
2. Constituents of Waste (s) ______
3. Waste Code ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6
4. Amount Burned (lbs./hr.) ______ Type of Auxil. Fuel (If Any) ______

D. STORAGE FACILITY

1. Tank Contents ______
2. Type of Tank or Bin ______ Height or Length (Ft.) ______
3. Capacity ______ (10^3 $Ft.^3$) ☐ (10^3 Gal.) ☐ Equivalent or Actual Diameter (Ft.) ______

THE REMAINING QUESTIONS ARE TO BE ANSWERED ONLY FOR LIQUID STORAGE

4. Vapor Pressure at 70°F (PSIA) ______ Storage Temp. If Not Ambient (°F) ______
5. Filling Rate (Gal/Min) ______ Annual Throughput (10^3 Gal/Yr) ______
6. Method of Fill ☐ Top ☐ Bottom ☐ Submerged ☐ Other (Explain Below)
7. Color of Tank ☐ White ☐ Other Exposed to Suns Rays ☐Yes ☐No
8. Insulation Data for Insulated Tanks (Volatile Organic Substances)
   Type ______, Thickness (Inches) ______, Thermal Conductivity (BTU/HR/FT^2/°F) ______

For Department Use Only

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Form VEM-003
1/79

Side 1

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

RECEIVED
DEC 22 10 18 AM '82
N.J. STATE DEPT. OF
ENV. PROTECTION
DIV. OF ENV. QUALITY

TO: New Jersey Department of Environmental Protection
Bureau of Air Pollution Control
CN-027
Trenton, New Jersey 08625

Read Instructions Before Completing Application

SECTION A

1. Full Business Name: GIVAUDAN CORPORATION
2. Mailing Address: 125 Delawanna Avenue (No.) (Street) Clifton, N.J. (City) (State) 07014 (Zip Code)
3. Division and/or Plant Name: -Same-
4. Plant Location: -Same- (No.) (Street) (Municipality) (County)
5. Location of equipment on premises (Bldg., Dept., area, etc.): Building 7
6. Nature of business: Aromatic Chemicals
7. Estimated starting date of construction: Existing Boiler No. 4
8. Date equipment to be put in use: N/A
9. Plant Contact: William S. Turetsky, Director Safety & Environ. Protect. (201) 365-852
Name (Print or type) Title Telephone No.

SECTION B

REASON FOR APPLICATION (CHECK ONE)

- ☐ New Equipment without Control Apparatus
- ☐ New Equipment with Control Apparatus
- ☐ New Control Apparatus on Existing Equipment
- ☐ Five Year Renewal of Certificate No. (s)
- ☒ Other (Explain) Grandfathered boiler requiring Air Permit under Hazardous Waste Regu
- ☐ Modification to Existing Equipment
- ☐ Modification to Existing Control Apparatus
- ☐ Painting Tank White

SECTION C

STACK INFORMATION (EQUIVALENT STACK INFORMATION)

1. Company Designation of Stack (s): No. 4 Boiler Stack
2. Previous Certificate Numbers (if any): None
3. a. Number of Sources Venting to this Stack: 2 (Complete a separate VEM-004 for each source)
   b. Number of Stacks Venting Source Operation (s): 1
4. Distance to the nearest Property Line (ft.): 160
5. Stack Diameter (inches): 60
6. Discharge Height Above Ground (ft.): 135
7. Exit Temperature of Stack Gases (°F): 400
8. Volume of Gas Discharged at Stack Conditions (A.C.F.M.): 32,000
9. Discharge Direction: ☐ Horizontal ☒ Up ☐ Down

The information supplied on applications VEM-003 and VEM-004, including the data in supplements, is to the best of my knowledge true and correct.

William S. Turetsky
Signature

December 15, 1982
Date

William S. Turetsky
Name (Print or type)

Director Safety & Environmental Protec
Title

This application will not be processed unless proper fee is submitted.

FOR ASSISTANCE CALL (609) 292-6716

FOR DEPARTMENT USE ONLY

☐☐☐☐☐ - ☐☐☐ - 000   025353

(over)

Form VEM-004
1/79

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR POLLUTION CONTROL

APPLICATION FOR
PERMIT TO CONSTRUCT, INSTALL OR ALTER CONTROL APPARATUS OR EQUIPMENT
AND
CERTIFICATE TO OPERATE CONTROL APPARATUS OR EQUIPMENT

Source Emissions And Source Data Form
(Complete this form for each source and submit with application Form VEM-003)

SECTION E

SOURCE INFORMATION

1. Source Description: Boiler No. 4

2. Operating Schedule: 24 Hours/Day; 8760 Hours/Year; 1947 Operation Starting Date

3. % Annual Production Throughput By Quarter: 25 Jan.-Mar.; 25 Apr.-June; 25 July-Sept.; 25 Oct.-Dec.

4. Volume Of Gas Discharged From This Source (ACFM): 16,000 Source Discharge Temperature (^{0}F): 400

SECTION F

CONTROL APPARATUS ON SOURCE

		Capital Cost (Dollars)	Annual Operating Cost (Dollars)	No. of Sources Connected
Primary	None	N/A	N/A	2
Secondary				
Tertiary				

SECTION G

AIR CONTAMINANTS FROM SOURCE

CONTAMINANT NAME	Emissions w/o Control (lbs./hr.)	Emissions with Control (lbs./hr.)	How Determined
Sulfur Dioxide	4.5		Stack Test
Carbon Monoxide	< 0.5		AP-42
Nitrogen Oxides	4		Stack Test
Hydrocarbons	< 0.5		Stack Test
Particulates	2		Stack Test

TO INSURE PROPER COORDINATION BETWEEN VEM- 003 AND VEM- 004 FORMS, INSERT IDENTICAL COMPANY NAME AN DESIGNATION OF STACK FROM VEM- 003, SIDE 1.

Full Business Name: GIVAUDAN CORPORATION

Company Designation of Stack (s): Boiler No. 4

(over)

SECTION H

A. MANUFACTURING AND MATERIALS HANDLING

1. Process Description ______

2. Total Amount Materials Processed ☐ Batch ______ lb/batch, ______ hr/batch
   ☐ Continuous ______ lb/hr

3. Raw Materials ______ % By Wt. ______ | Raw Materials ______ % By Wt. ______

B. FUEL BURNING EQUIPMENT

1. Gross Heat Input (10^6 BTU/HR) 30

2. Type Heat Exchange ☒ Direct ☐ Indirect ☐ Internal Combustion Engine

	PRIMARY FUEL	SECONDARY FUEL
3. a. Type of Fuel:	Residual Oil	Non-commercial fuel
b. Heating Value (Btu/lb):	18,900	16,000
4. Method of Firing:	2 Burner Nozzles	1 Burner Nozzle
5. % Sulfur in Fuel (Dry):	0.29	Nil
6. % Ash Content of Fuel (Dry):	0.1 Max.	0.9
7. Amount Burned/Yr.	< 1,000 (10^3 gallons)	< 150 (10^3 gallons)

Units: Solid Fuel (Tons) Liquid Fuel (10^3 Gal.) Gaseous Fuel (10^6 Ft.^{3})

C. INCINERATION

1. Type of Unit ______

2. Constituents of Waste (s) ______

3. Waste Code ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6

4. Amount Burned (lbs./hr.) ______ Type of Auxil. Fuel (If Any) ______

D. STORAGE FACILITY

1. Tank Contents ______

2. Type of Tank or Bin ______ Height or Length (Ft.) ______

3. Capacity ______ (10^3 Ft.^{3}) ☐ (10^3 Gal.) ☐ Equivalent or Actual Diameter (Ft.) ______

THE REMAINING QUESTIONS ARE TO BE ANSWERED ONLY FOR LIQUID STORAGE

4. Vapor Pressure at 70°F (PSIA) ______ Storage Temp. If Not Ambient (°F) ______

5. Filling Rate (Gal/Min) ______ Annual Throughput (10^3 Gal/Yr) ______

6. Method of Fill ☐ Top ☐ Bottom ☐ Submerged ☐ Other (Explain Below)

7. Color of Tank ☐ White ☐ Other Exposed to Suns Rays ☐Yes ☐No

8. Insulation Data for Insulated Tanks (Volatile Organic Substances)
   Type ______, Thickness (Inches) ______, Thermal Conductivity (BTU/HR/FT^2/°F) ______

For Department Use Only

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Quality

SOURCE DATA SHEET - BOILERS BURNING LIQUID WASTE

1) Burning Rate of Waste (lb/hr) 900# - 1,000#/hr./Boiler
2) Density of Waste (lb/gal) 6# to 8#/gal.
3) Net heating value of waste (BTU/lb) 16,000 to 18,000 BTU/lb.
4) Boiler Type - Model etc..... #4 Babcock & Wilcox - BH9033 - Oil Burning Steam #F1212 #5 Wickes Boiler Co. - BH-1 Oil Burning Steam #D3784
5) Boiler Capacity (10^6BTU/hr) 35-40 x 10^6 BTU/hr.
6) Burning Rate of the commercial fuel (lb/hr) 1600-3400 lb./hr.
7) Temperature in Fire Box 1,850° to 2,100°F
8) Residence time (sec)-at above temperature 5-6 seconds
9) What is the minimum destruction efficiency of hydrocarbons 99.9009
10) Principal organic hazard components See Attachment No. 1

    Is the burning device located in an area zoned for industrial use? X Yes ___ No
11) Include the emissions in lb/hr of all possible contaminants (including CO_2 & H_2O). Attachment No. 2.
12) Provide a listing of each specific waste, and the composition of each waste. Attachment No. 3
13) Explain what record-keeping procedures are used to monitor the waste burned. Attachment No. 4.
14) Describe how the waste feed rate will be continuously monitored. Will flow meters be used? Will waste fuel be fed on a batch basis? Attachment No. 5
15) Explain how the waste is generated. Show unit operations and include flow diagrams. On site generated. Attachment No. 6
16) Demonstrate that the device has a minimum combustion efficiency of at least 99.9% as determined by the following formula where Carbon Dioxide (CO_2) and Carbon Monoxide (CO) are measured in concentration by volume:

    Combustion Efficiency = $CO_2/(CO_2+CO) \times 100\%$ Attachment No. 7
17) You are required to continuously monitor O_2 and either CO or total Hydrocarbons. Please submit details on the sampling equipment, sampling procedures and sampling locations. Attachment No. 8
18) You are required to have a full time operator present when the waste is burned. The engineer-in-charge must possess, 1-C "Blue Seal" third class engineers license. Please send copy of his license. Attachment No. :

Attachment No.1

Question NO. 10)

Principal Organic Hazard Components

Recovered solvents, off spec products and still bottoms of aldehydes, alcohols, esters, ketones, hydrocarbons and other organic chemicals and their decomposition products.

Attachment No. 2

Question No. 11)

Contaminant Name	Emissions w/o Controls (lbs/hr)	How Determined
Sulfur Dioxide	4.5	Stack Test
Carbon Monoxide	0.5	AP-2
Nitrogen Oxides	4	Stack Test
Hydrocarbons	0.5	Stack Test
Particulates	2	Stack Test
Carbon Dioxide	10%	Orstat Test
Water	Unknown	

Attachment No. 3

Question No. 12

WASTE PRODUCT RECORD
Waste Description (at 70°F)

PHYSICAL PROPERTIES OF THE WASTE:

Physical state at 70°F: SOLID SEMI-SOLID [LIQUID] OTHER: ______

Viscosity at 70°F: [LOW] MEDIUM HIGH

Flash Point: below 140°F Closed Cup Open Cup

pH Range: 1-3 3-5 5-7 [8-9] 9-11 11-13 N.A.

Layering (for liquids only): [NONE] MULTILAYERED BILAYERED

Specific Weight: .8000 to 9250 (as # per unit).

Vapor Pressure: Unknown (for liquids only; in mm Hg at 70°F)

BTU/LB : 13,500

ASH CONTENT @650°C : .3 to 1

CHLORINE BY WEIGHT(%): O-TRACE OR Trace %

SULFUR BY WEIGHT(%) : O-TRACE OR None %

CHEMICAL COMPOSITION

Component

The following materials, but not limited to, recovered solvents, off specification organic materials and still bottoms of aromatic and aliphatic aldehydes, alcohols, esters, ketones, hydrocarbons, and/or their decomposition products can be present in varying amounts acetone, butyl alcohol, cyclohexane, ethyl acetate, ethyl, methyl, isopropyl alcohols, heptante, hexane, isobutanol, isopropyl acetate, methyl ethyl ketone, toluene, acetanisole, acetates C8 to C12, aldehydes C7 to C18, allyl caproate, amyl benzoate, substituted alcohols, aldehydes and acetates, alcohols C7 to C12, aromatic alcohols, aldehydes and acetates, xylene, dimethyl butane, propylene, isobutane and other materials used by the flavor and fragrance industries.

Attachment No. 4

Question No. 13

Waste Recordkeeping - Monitoring Procedure

Incoming Material

1. Specific Organic: By Gas Chromotography
2. Halogen Content: Flame test, modified from National formulary, Eleventh Edition, pg. 46

Blend (Fuel) Waste

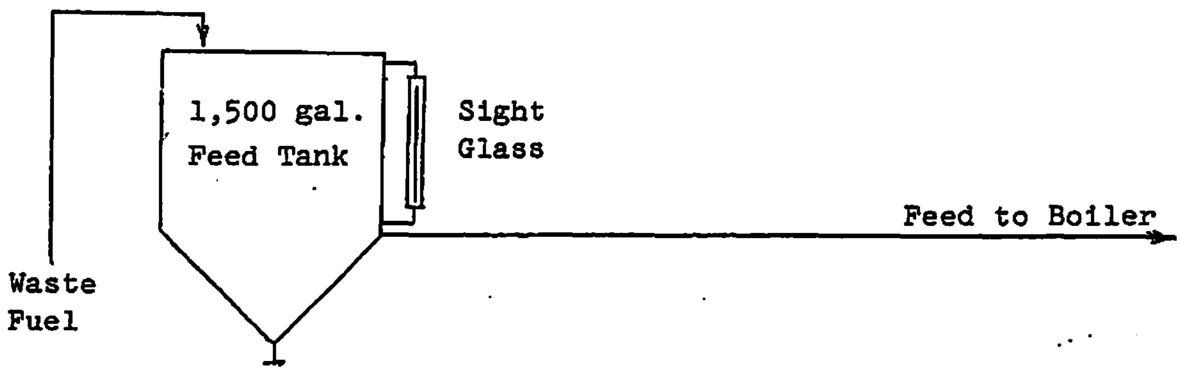
1. Acid Value: By Titration
2. Moisture Content: By Carl Fisher method.
3. Ash Content: Residue on Ignition - from U.S. pharmacopeia, 16th Revision, page 907
4. Halogen Content: Flame Test - modified from National Formulary, Eleventh Edition, pg. 46

All lab analysis records are maintained on-site.

Attachment No. 5

Question No. 14)

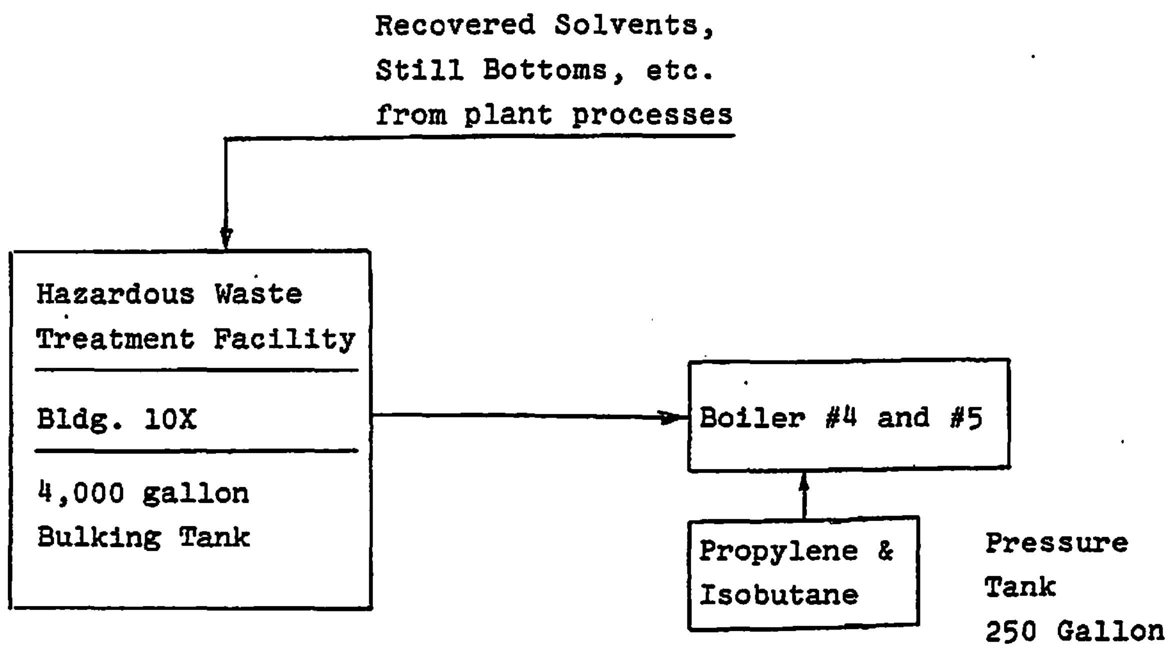
There are no flowmeters and the waste fuel will be fed on a batch basis.



Boilers No. 4 & 5 have 3 nozzles each. Two are on Commercial Fuel and one is on Waste Fuel. It takes 10 to 15 hours to feed in the 1,500 gallons of waste fuel.

Attachment No. 6

Question No. 15)



Attachment No. 7

Orstat Test showed Carbon Dioxide (CO_2) reading registered 11%.

CO_2 range is 9 to 13% by volume

Combustion Efficiency = $CO_2/CO_2 + CO$ x 100%

(CO percent at 9% CO_2

$$99.9 = 9/9 = CO \times 100\%$$

$$99.9\ (9 + CO) = 900$$

$$899.1 + 99.9\ CO = 900$$

$$99.9\ CO = 900 - 899.1$$

$$CO = .9/99.9$$

$$CO = .009009\%$$

(CO percent at 13% CO_2)

$$99.9 = 13/13 + CO \times 100$$

$$99.9\ (13 + CO) = 1300$$

$$1298.7 + 99.9\ (\%\ CO) = 1300$$

$$CO = 1.3/99.9$$

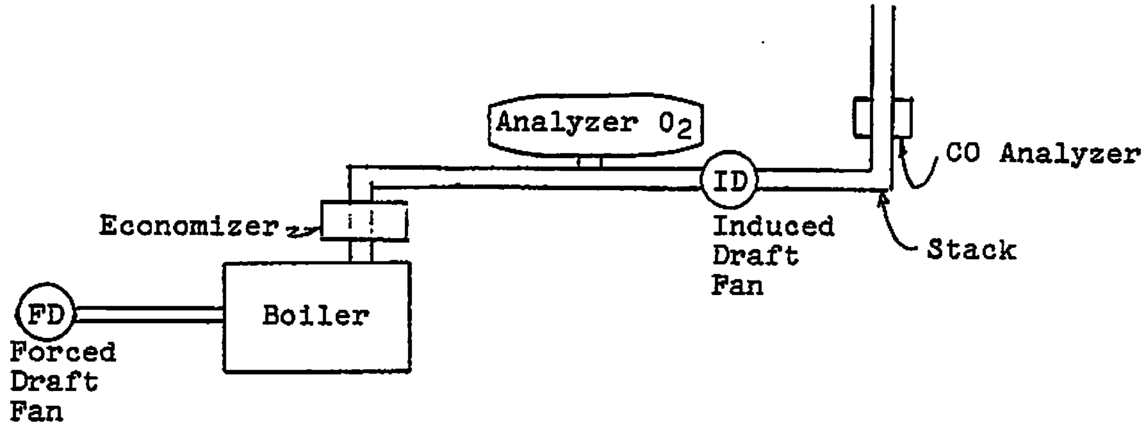
$$CO = .013013\%$$

Limit 9% CO_2 = 90 ppm or .009%

Limit 13% CO_2 = 130 ppm or .013%

Attachment No. 8

Question No. 17)

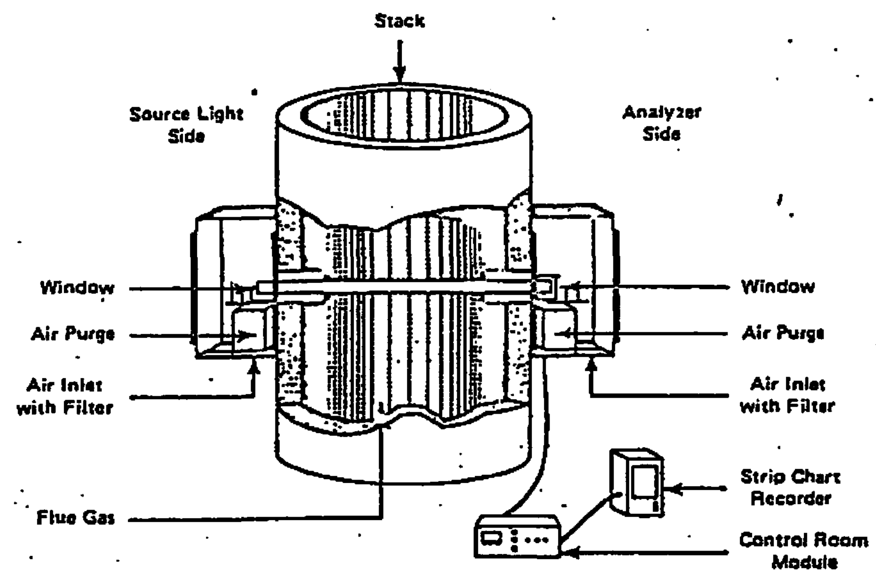


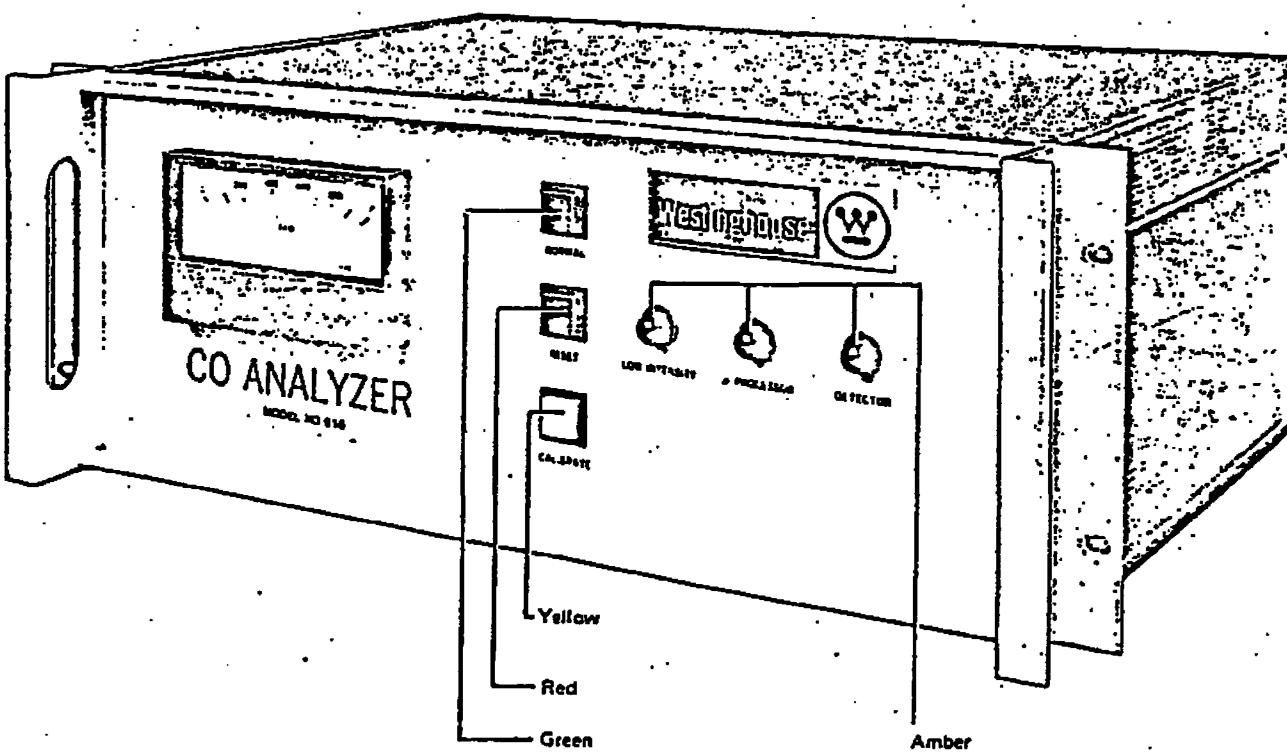
Pictured above is the O_2 and CO analyzers location in boiler.

O_2 is Westinghouse Zerconium Unit

CO is Princeton Research Infra Red Unit

ATTACHMENT 8





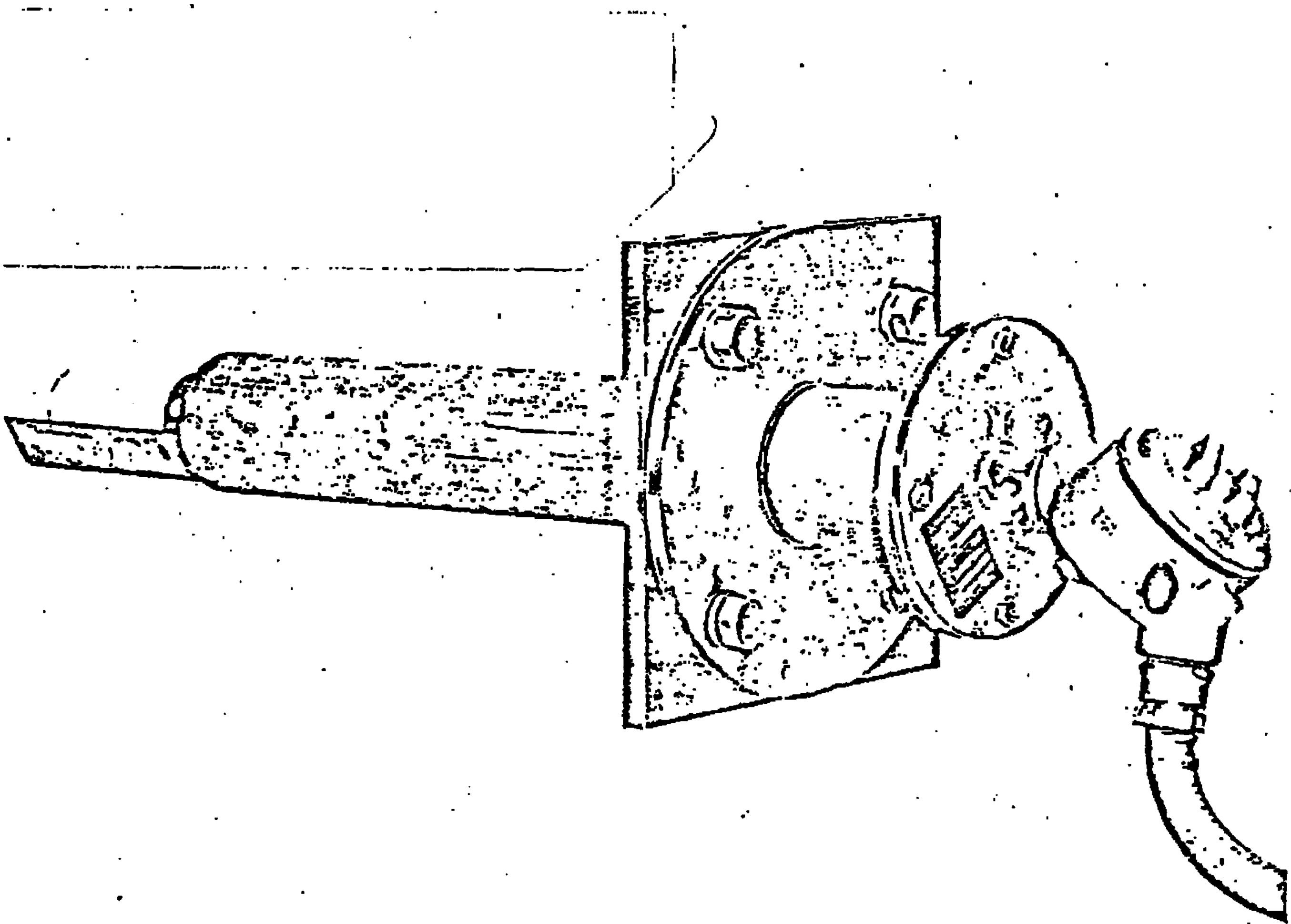
Westinghouse Electric Corporation
Computer & Instrumentation Division
Orrville, Ohio, U.S.A. 44667

I.B. 106-101
Instruction Bulletin

February, 1981
Supersedes I.B. 106-101 Dated March, 1978 and I.B. 106-102 Dated June, 1979

Hagan Model 218

Probe Type Oxygen Analyzer Package



SYSTEM OVERVIEW
MODEL 218 PROBE-TYPE OXYGEN SENSING SYSTEM

GENERAL

The Westinghouse Probe-Type Oxygen Analyzer is a heavy duty industrial package designed to measure the net concentration of oxygen in an industrial process; i.e., the oxygen remaining after all fuels have been oxidized. It performs this task without the use of a sampling system.

The equipment measures oxygen percentage by reading the voltage developed across a heated electrochemical cell which consists of a small yttria-stabilized, zirconia disc. Both sides of the disc are coated with porous metal electrodes. When operated at the proper temperature (maintained by a Temperature Controller), the millivolt output voltage of the cell is given by the following Nernst equation:

$$EMF = KT \log_{10} \frac{P1}{P2} + C$$

Where: P2 is the partial pressure of the oxygen in the measured gas on one side of the cell, and P1 is the partial pressure of the oxygen in the reference gas on the other side. Normal air from a clean, dry, instrument air supply (20.95 % oxygen) is used as the reference gas. T is the absolute temperature; C is the cell constant, and K is an arithmetic constant.

When the cell is at operating temperature and there are unequal oxygen concentrations across the cell, oxygen ions will travel from the high partial pressure of oxygen to the low partial pressure side of the cell. The resulting logarithmic output voltage is approximately 53 mV per decade. Because the magnitude of the output signal is proportional to the logarithm of the inverse of the sample oxygen partial pressure, the output signal increases as the oxygen concentration of the sample gas decreases. This characteristic enables the analyzer to provide exceptional sensitivity at low oxygen concentrations.

The Model 218 Probe-Type Oxygen Sensing Equipment measures net oxygen concentration in the presence of all the products of combustion, including water. It may therefore be considered as an analysis on a "wet" basis. In comparison with older methods, such as the Orsat apparatus, which provides an analysis on a "dry" gas basis, the "wet" analysis will, in general, indicate a lower percentage of oxygen. The difference will be proportional to the water content of the sampled gas stream.

System Configuration

At the end of this section on page 9 is a fold-out diagram illustrating an overview of the possible Westinghouse Oxygen Analyzer Systems referred to in this instruction book. Since many references in this section will be made to this diagram, the page should be unfolded and used as a reference as you continue through the Instruction Book.

Figure 1 on the following page lists the various Westinghouse part numbers for available oxygen analyzer systems as well as the reference item numbers in Figure 12 for the elements making up a system. By referring to the Shipping & Receiving documents or the customer copy of the Westinghouse Shop Order, identifying the individual components in your system and locating them on the Figure 1 table, you will see how your system's components work together as a fully operational system.

The Sensor

Items 1 and 2 in Figure 12 illustrate the oxygen probe. The probe is the sensor element in the Westinghouse Oxygen Analyzer System. The probe fits directly into the process gas stream, thus no sampling system is required.

It measures the net concentration, developing a voltage which is a function of this concentration. Probes are available in five lengths (18 inch, 3, 6, 9, and 12 ft.). The probe unit is equipped with a ceramic filter and heat shield and is also available with a flame arrestor that meets Factory Mutual (F.M.) approval.

A probe is also available for use with the 2 Point Calibrator, which provides an automatic calibration check every 24 hours. This option also provides remote calibration check on command. Item 2 in Figure 12 represents this version of the probe.

A detailed description of the standard probe construction is given on page 5 with installation instructions on page 11 and service and trouble shooting on page 24.

The Electronics Package

The electronics package is a field mounted housing or housings containing the Probe Temperature Controller, power supply and amplifier.

The Temperature Controller maintains the temperature of the oxygen sensing cell at a constant 1550 degrees F (843 degrees C) by modulating the duty cycle of the 115V heater in the probe. The temperature controller is an electronic printed circuit board and is enclosed in either a NEMA 12 or a hazardous area type enclosure.

The power supply for the temperature controller requires a second printed circuit card which is always housed with the Temperature Controller.

The amplifier accepts the millivolt signal generated by the sensing cell in the probe and produces a standard 4-20 ma. current signal to be used with remotely connected devices. Normally this amplifier is integrally mounted on the same printed circuit card as the power supply. Thus the two cards, the Temperature Controller and power supply/amplifier cards, represent a complete electronic package. The amplifier is either logarithmic or linear with the linear version available with either non-isolated or isolated input/output. Items 3, 5 and 7 in Figure 12 illustrate the three available packages for this standard two-card configuration.

Item 3 represents the NEMA package, Item 5 is the Hazardous Area package and Item 7 is the NEMA Two-Point Calibrator package.

When special system needs require exceptional radio frequency interference protection, the amplifier function is omitted from the basic two-card package and the amplifier function is performed by a separate amplifier and its 24 volt power supply. Items 4, 6 and 8 in Figure 12 represent the NEMA, Hazardous Area, and Two-Point Calibrator packages containing the Temperature Controller and power supply only cards. Items 9 and 10 are the remote amplifier with isolation and RFI protection and its 24V power supply.

Regardless of which electronic package is selected, a 4-20 ma current signal is produced for use with the available computer, control, or display elements.

A detailed description of all the electronic packages is given on page 7, installation instructions are on page 12 and service and troubleshooting are on page 24.

Because of the special nature of the Two-Point Calibrator packages (Items 7 and 8 Figure 12), and the additional functions performed by the package, a separate instruction bulletin (IB 106-103) describes these packages in full detail.

Computer Elements

The probe sensor and electronics package produce a signal proportional to the logarithm of the inverse of the sample oxygen partial pressure. It is often desirable, however, to obtain a signal linearly proportional to oxygen. Such a linear signal is necessary when two or more sensor element signals are to be averaged in order to obtain a more representative reading over large duct cross sections or when the measurement signal is to be used in a closed loop control system where constant loop gain is desirable.

The VERITRAK inverse analog generator module (Item 11 Figure 12) and the 24V power supply (Item 10, Figure 12) provides the linearizer function when required. A description of this element along with installation and service instructions is included in the Instruction Bulletin IB-101-806.

When several probes are used in the same duct and an average value is required, an averaging module (Item 12, Figure 12) is required. This module accepts up to six linearized oxygen signals and produces a single output. A description of this element along with installation and service instructions is included in Instruction Bulletin IB-SP-1872.

Display Functions

A number of recorders, recorder/controllers or indicators (Item 13, Figure 12) are available for use with the Westinghouse Oxygen Analyzer systems. These components accept the 4-20 ma signal from the amplifier, linearizer or averager to indicate, record or control the oxygen value.

Recorders include a round chart model which provides a 24-hour record on a single chart (See IB-105-003), an Optimac Recorder with horizontal scale and vertical paper travel (See IB-104-601) or a VERITRAK strip chart recorder controller with vertical scale. Indicators can include vertical voltmeters (IB-104-602), Servo-driven indicators (IB-101-435) or solid state, all-electronic analog displays.

Attachment No. 9

Question No. 18)

Audit Nº 144227

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-42203 Expiration Date 6-30-84

Classification-Grade 1-C Issue No. 15-16-17

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name GILBERT P. MEAD

Address 65 EDISON AVENUE
NUTLEY, NJ 07110

Signature Gilbert P. Mead

This identification card should be posted with License. Signed original must be returned for renewal.

Audit No. 157630

State of New Jersey
Department of Labor
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625-0392

MI-2 (R-2-82)

IDENTIFICATION CARD

License No. A-34918 Expiration Date 11-30-85

Classification-Grade 1-2-C Issue No. 31-32-33

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name JOHN KALINOWSKI

Address 12 LANZA AVENUE
GARFIELD, NJ 07026

Signature John Kalinowski

This identification card should be posted with License. Signed original must be returned for renewal.

Audit Nº 137787

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-49360 Expiration Date 2-28-84

Classification-Grade 1-C Issue No. 2-3-4

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name TIMOTHY G. FREY

Address 50 LAMBERT ST.
CLIFTON, NJ 07013

Signature Timothy G. Frey

This identification card should be posted with License. Signed original must be returned for renewal.

Audit Nº 137533

State of New Jersey
Department of Labor and Industry
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625

MI-2 (R-7-80)

IDENTIFICATION CARD

License No. A-36518 Expiration Date 3-31-84

Classification-Grade 1-C Issue No. 26-27-28

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name JOSEPH KLUCZNIK

Address 26 CUTLER STREET
CLIFTON, NJ 07011

Signature Joseph Klucznik

This identification card should be posted with License. Signed original must be returned for renewal.

Audit No. 160032

State of New Jersey
Department of Labor
Mechanical Inspection Bureau
C N 392
Trenton, N. J. 08625 0392

MI-2 (R-2-82)

IDENTIFICATION CARD

License No. A-43112 Expiration Date 1-31-86

Classification-Grade 1-C (REF.SPEC.) Issue No. 14-15-16

The licensee identified hereon holds the above classification and grade. License Certificate is posted where employed.

Name RUSSELL J. HELSENS

Address 12 IRVINGTON PLACE
CLIFTON, NJ 07013

Signature Russell J. Helsens

This identification card should be posted with License. Signed original must be returned for renewal.

NJ DEPT OF ENVIORNMENTAL

VOUCHER NO. 068377

THE ACCOMPANYING CHECK IS IN FULL PAYMENT OF ITEMS BELOW - DETACH BEFORE BANKING

	GIVAUDAN I.D.	GROSS AMT.	DISCOUNT
INV#	88631 $	130.00 $	.00

Building 7 Boilers #4 & #5 @ $65.00 per permit.
Tracking Nos. 825353 & 825354

GIVAUDAN CORPORATION - 100 DELAWANNA AVENUE, CLIFTON, NEW JERSEY 07014

GIVAUDAN
CLIFTON, NEW JERSEY

55-357
212

FIDELITY UNION
TRUST COMPANY, N.A.
MORRISTOWN, N.J.

DATE	CHECK NO.	GROSS	DISCOUNT	AMOUNT
04/12/84	068377	$130.00	$.00	$*****130.(

PAY *********130** DOLLARS AND 00 CENTS

TO THE ORDER OF * NJ DEPT OF ENVIORNMENTAL
PROTECTION
*

GIVAUDAN CORPORATION

⑈068377⑈ ⑆021203572⑆ 201 000013 7⑈

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF REGULATORY SERVICES
CN 402
TRENTON, N.J. 08625
609-292-2906

MICHAEL F. CATANIA
DIRECTOR

HERBERT B. BENNETT
DEPUTY DIRECTOR

May 8, 1984

Mr. William Turetsky, Director
Safety and Environmental Protection
Guivaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Dear Mr. Turesky:

Enclosed please find a copy of the most recent "Easy Access" and related organizational charts.

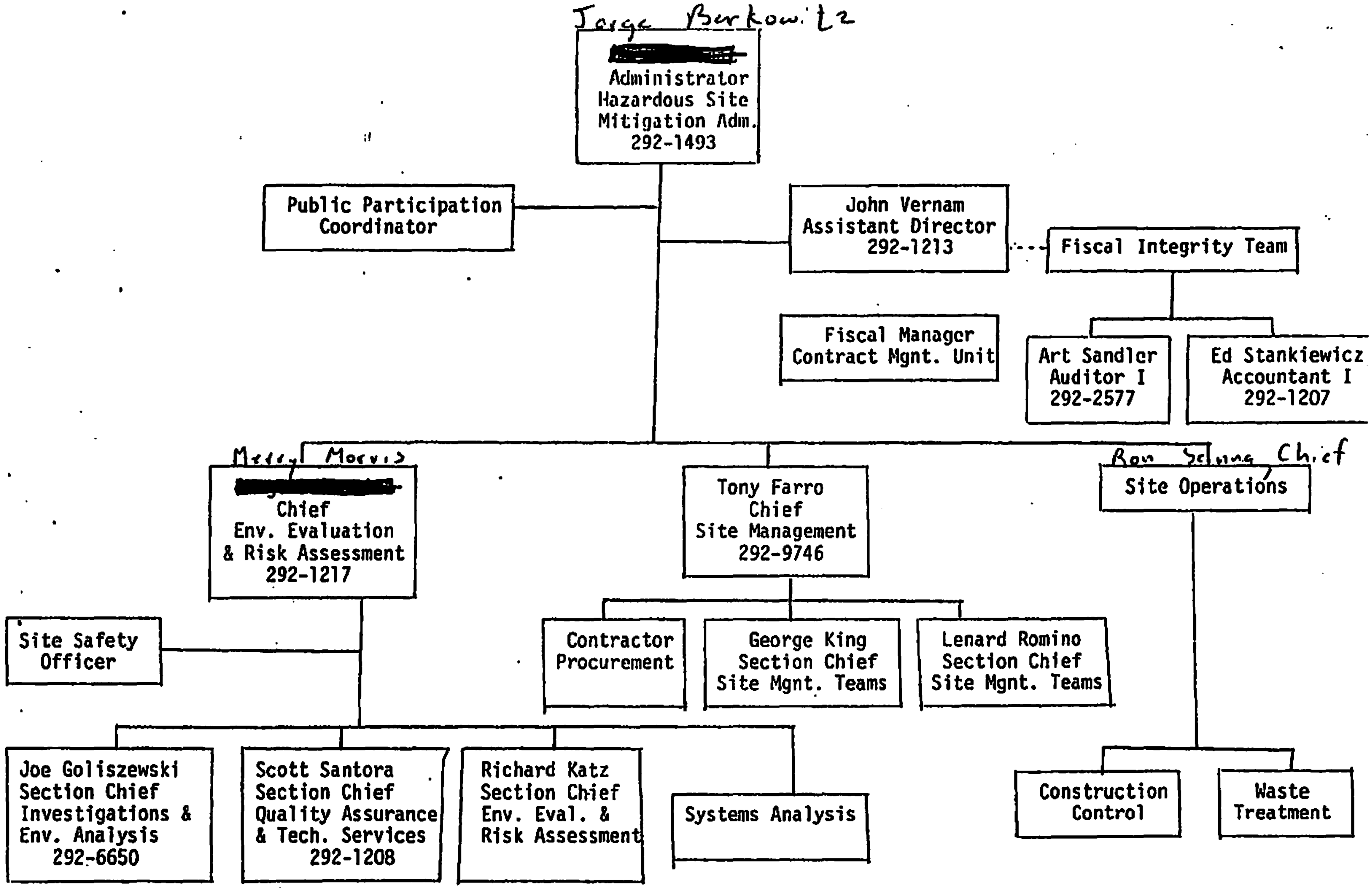
Very truly yours,

George F. Schlosser

George F. Schlosser
Regulatory Officer

GFS:bb
Enclosures

J. Parkin
J. Sc leris
F. Levy
H. Brandman + 2



Jorge Berkowitz
[redacted]
Administrator
Hazardous Site
Mitigation Adm.
292-1493
Public Participation
Coordinator
John Vernam
Assistant Director
292-1213
Fiscal Integrity Team
Fiscal Manager
Contract Mgnt. Unit
Art Sandler
Auditor I
292-2577
Ed Stankiewicz
Accountant I
292-1207
Meryl Morris
[redacted]
Chief
Env. Evaluation
& Risk Assessment
292-1217
Tony Farro
Chief
Site Management
292-9746
Chief
Site Operations
Site Safety
Officer
Contractor
Procurement
George King
Section Chief
Site Mgnt. Teams
Lenard Romino
Section Chief
Site Mgnt. Teams
Joe Goliszewski
Section Chief
Investigations &
Env. Analysis
292-6650
Scott Santora
Section Chief
Quality Assurance
& Tech. Services
292-1208
Richard Katz
Section Chief
Env. Eval. &
Risk Assessment
Systems Analysis
Construction
Control
Waste
Treatment

DIVISION OF WASTE MANAGEMENT

- Marwan Sadat
  [redacted]
  Director
  292-9120
  - Kathy Geiger
    Acting Chief
    Administrative Services
    984-3110
  - Lee Pereira
    Deputy Director
    292-9120
    - Robin O'Malley
      Staff Ass't
      984-3122
    - [redacted]
      Executive Assistant
      984-1268
    - Michael DeBonis
      Assistant Director
      Planning & Resource Recovery
      292-8879
      - Shirley Schillman
        [redacted]
        Chief
        Classif. & Manifest
        292-8341
      - Mary Sheil
        Chief
        Office of Recycling
        201-648-6295
      - Bart Carhart
        Chief
        Solid Waste Planning
        292-7422
    - Joseph Rogalski
      Assistant Director
      Field Operations
      Compliance & Enf.
      984-3697
      - Ron Corcory
        Chief
        Field Operations
        984-3694
      - Dave Shotwell
        Chief
        Compliance and Enforcement
        292-3868
    - Edward Londres
      Assistant Director
      Engineering Permits and Licensing
      984-4077
      - Walt Burshtin
        Chief
        Solid Waste Eng. Review & Permits
        292-7019
      - Tony Cavalier
        Chief
        Disclosure Stmt. Review & Permits & License Issue.
        292-9879
      - Frank Coolick
        Chief
        Haz. Waste Eng. Review & Permits
        292-9880
    - Jorge Berkowitz
      [redacted]
      Administrator
      Hazardous Site Mitigation Administration
      292-1493
      - John Vernam
        Assistant Director
        292-1213
      - Dr. Merry Morris
        [redacted]
        Chief
        Env. Evaluation & Risk Assessment
        292-1217
      - Tony Farro
        Chief
        Site Mgnt.
        292-9746
      - Ron Senna
        chief
        Site Operations
        984-5993

Easy Access

A Guide Through the Department of Environmental Protection

Thomas H. Kean, Governor

Robert E. Hughey, Commissioner

State of New Jersey

RECEIVED

JUL 14 1983

PITNEY, HARDIN, KIPP & SZUCH

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF REGULATORY SERVICES
CN 402
TRENTON, N.J. 08625
609 - 292 - 2906

MICHAEL F. CATANIA
DIRECTOR

HERBERT B. BENNETT
KEITH A. ONSDORFF
ASSISTANT DIRECTORS

July 12, 1983

Mr. William Hyatt
Pitney, Hardin, Kipp & Szuch
163 Madison Avenue
Morristown, NJ 07960

Dear Mr. Hyatt:

I am writing to confirm our telephone conversation of this morning concerning the movement of hexachlorophene from the Givaudan facility in Clifton, New Jersey. The prohibition on this movement contained in paragraph two of the Administrative Order dated June 17, 1983 is hereby revised as outlined below.

It is my understanding that Givaudan has conducted dioxin analysis on a substantial portion of the finished product hexachlorophene presently stored at the facility. This analysis, which was conducted by a laboratory certified by USEPA for dioxin analysis, has indicated no dioxin contamination of this product at the one part per billion detection level. Based upon these results, Givaudan is hereby authorized to move all hexachlorophene not located in buildings 52 through 65 for which the above dioxin analysis has been received. This authorization is, however, subject to any further requirement which the Food and Drug Administration may impose on the movement of this product.

As further analytical data becomes available and is transmitted to this Department concerning the remainder of the finished product hexachlorophene stored on site, the above procedure shall be utilized to determine whether that product be moved off site.

An additional condition for the movement of hexachlorophene from the Givaudan facility is that Givaudan must notify this Department and the Food and Drug Administration of the destination and purchaser of these shipments.

Please do not hestitate to contact me if you have any questions concerning the above.

Sincerely,

Michael F. Catania

Michael F. Catania

dm

cc: Commissioner Robert E. Hughey
Director Thomas Burke
Administrator Marwan Sadat
Dr. Bill Parkin, DOH
Len Fantasia, FDA

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

August 17, 1984

Mr. David A. Marlow R-14
NIOSH
Industrial Hygienist
Industrywide Studies Branch
Div. of Surveillance, Hazard
Evaluations & Field Studies
4676 Columbia Parkway
Cincinnati, Ohio 45226

Dear Mr. Marlow:

In response to Dr. Fingerhut's letter of February 8, 1984, we are submitting the attached information.

Please contact us if you have any questions concerning this submission.

Sincerely,

GIVAUDAN CORPORATION

M. Manowitz

M. Manowitz, PhD.
Vice President-R&D

MM/dj
Attachment

Response - Fingerhut letter, February 8, 1984

1.

A. Hexachlorophene (HCP) was manufactured by the Givaudan Corporation from 1947 to 1984. During 1984, production of this product was terminated. The approximate quantities of HCP produced per year were as indicated on Table I.

B. 2,4,5-Trichlorophenol (TCP) was manufactured by the Givaudan Corporation during the years 1948 and 1949. Approximately 300,000 pounds of TCP were produced for on-site consumption during this period.

C. Givaudan has <u>not</u> manufactured 2,4,5-trichlorophenoxy acetic acid and/or its esters, amines and/or salts.

2.

A. Hexachlorophene Process

Ethylene dichloride (ED), pure 2,4,5-trichlorophenol and oleum 20% are charged into a glass lined reactor and heated to 68°C. Paraformaldehyde is added over a period of 1-1/2 hrs maintaining the temperature between 72-76°C. The condensation of trichlorophenol and paraformaldehyde in sulfuric acid results in the formation of hexachlorophene (HCP). The batch is refluxed and then allowed to settle and the sulfuric acid drained away. The HCP and ED are refluxed with filtrol and filtered. The ED is stripped off by steam, the remaining HCP is steamed for several hours, cooled, filtered and dried at about 110°C. Sulfuric acid and filtrol are waste products from this process. Ethylene dichloride is recycled.

B. 2,4,5-Trichlorophenol Process

Givaudan believes that the 2,4,5-trichlorophenol in 1948-1949 was manufactured by the alkaline hydrolysis of 1,2,4,5-tetrachlorobenzene with caustic soda dissolved in ethylene glycol. After reaction, a batch was neutralized with muriatic acid and the sodium chloride precipitate was removed by filtration. The filtrate was diluted with water and the TCP ex-

Table 1

G-11 (HEXACHLOROPHENE) PRODUCTION

YEAR	POUNDS(x10^3)	YEAR	POUNDS(x10^3)	YEAR	POUNDS(x 10^3)
1947	42	1960	1,000	1973	150
1948	100	1961	1,000	1974	200
1949	500	1962	1,500	1975	100
1950	500-1,000	1963	1,500	1976	500
1951	1,000	1964	2,000	1977	500
1952	500-1,000	1965	2,500	1978	100-500
1953	1,000	1966	2,000-2,500	1979	100-500
1954	1,000	1967	2,000-2,500	1980	100-500
1955	1,500	1968	3,000	1981	100-500
1956	1,500-2,000	1969	3,000-3,500	1982	100
1957	1,000	1970	3,000	1983	100-500
1958	500	1971	3,000-3,500	1984	17
1959	500-1,000	1972	1,000		

tracted with benzene. The benzene extract was washed with water and the benzene removed by distillation. The crude TCP was distilled in a high vacuum still. Ethylene glycol was recovered by fractionation and reused in the process.

3.

Responsibilities and duties of those workers involved in the processes described in question 2 and how these duties and responsibilities are performed follow.

A. HCP Operator Duties

Reactor Operator Duties/Direct Duties

1. Charge Reactor
   a. ED via meter
   b. TCP from containers to melt tank to reactor
   c. Oleum 20% via weigh tank
2. Charge reactor feed hopper with pre-weighed paraformaldehyde (PFA)
3. Reaction:
   a. Feed PFA to reaction, control temperature
   b. Reflux reaction mass
   c. Pump finished batch to 1st Settler (Settling vessel) containing ED extracts
4. Separate off spent acid layer via pump to 2nd Settler (Extractor)
5. Pump batch to treatment tank (Decolorizer)
6. Extract spent acid layer with fresh ED (3x). Pump extracts to 1st settler or storage tank
7. Pump extracted acid layer to solvent recovery still and distill off ED solvent under vacuum
8. Pump solvent free spent acid to sewer or storage tank for reprocessing

Sparkler Filter Operator/Steam Still Direct Duties

1. Charge treatment tank (decolorizer) batch
   a. Filtrol (Bentonite clay) from bags via hopper
   b. Super Cel (Diatomaceous Earth) via hopper
   c. HCP rework via hopper
   d. As required, asbestos/cement fiber via hopper

2. Reflux batch to decolorize and remove water

3. Precoat sparkler filter with Super Cel suspended in ED

4. Filter batch to solution holding tank (feed tank)

5. Wash filter with ED

6. Vacuum dry filter

7. Remove sparkler filter cartridge

8. Clean filter

9. Replace clean filter cartridge

10. Disassemble sparkler cartridge
    Clean off spent filtrol, reassemble

11. Feed filtered batch to steam still and steam strip off ED and TCP

Filterpress/Dryer Operator

1. Fill, drop, clean and reassemble filter presses
2. Load dryer with wetcake
3. Run dryer
4. Unload dryer into powder carts for grinding
5. Cut and replace defective filter cloths
6. Clean out filterpress room trenches of spilled product
7. Filter and dry HCP rework

B. <u>TCP Operator Duties</u>

Unfortunately there are insufficient records describing the TCP operation that took place 35 years ago to provide a valid description of these duties and responsibilities.

4.

There have been no major changes in the process described in question 2.

5.

There have been no major accidents from the process described in question 2 to the best of our knowledge.

6.

See attachment. (Hexachlorophene Process Flow Diagram, Drawing No. B-9483).

7.

No other chemical processes shared the same equipment used in the manufacture of HCP.

8.

The following information is provided in response to your request for additional documents that are pertinent to the NIOSH Dioxin Registry.

- Letter dated June 13, 1983 from Andrew Stofa to Mr. Robert Hallock - OSHA - TCDD sampling.
- Inter-Office Memo dated April 30, 1981 from P. Doucette to A. Gerardo - OSHA Inspection
- Inter-Office Memo dated May 18, 1981 from P. Doucette to P. Gross - OSHA Inspection
- Letter dated August 13, 1981 from P. Doucette to Mr. A.M. Webber, Esq.
- Inter-Office Memo dated October 5, 1981 from P. Doucette to P. Gross - OSHA Inspection
- Inter-Office Memo dated October 31, 1983 from W. Turetsky to Mr. J. Rankin - Unannounced OSHA Visit

:dj

DEPARTMENT OF ENVIRONMENTAL PROTECTION
RICHARD T. DEWLING, Ph.D., P.E.
COMMISSIONER
CN 402
TRENTON, N.J. 08625
609 292-2885

IN THE MATTER OF
GIVAUDAN CORPORATION

ADMINISTRATIVE
CONSENT ORDER
TCDD

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter the "Department") by Executive Order No. 40B (1983), signed by Governor Thomas H. Kean on June 17, 1983, N.J.S.A. App. A:9-45, N.J.S.A. 13:1D-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.

FINDINGS

1. Givaudan Corporation (hereinafter "Givaudan") owns and operates an office, manufacturing, packaging, storage, shipment and research complex on 31.43 acres on Delawanna Avenue, Clifton, New Jersey (hereinafter "the Givaudan Plant") which currently has approximately 685 employees and has been assessed by Clifton for 1984 real estate tax purposes at $9,597,700. The Givaudan Plant includes a chemical manufacturing facility located to the south of Delawanna Avenue, at 125 Delawanna Avenue (Block 73-3, Lot 2) (hereinafter "the Site").

2. Givaudan manufactures a variety of aromatic chemicals at the Site and, until on or about April, 1984, manufactured hexachlorophene, an antibacterial agent used in hospitals, at the Site using, as a raw material, 2,4,5-Trichlorophenol (hereinafter "TCP") which was pre-purified. During 1947 and 1948, Givaudan also manufactured TCP at the Site.

3. On June 3, 1983, Givaudan agreed, at the request of the Department, to conduct a sampling program designed to ascertain the presence or absence of 2,3,7,8-Tetrachlorodibenzo- p-dioxin (hereinafter "TCDD") in or on the soils, waters, equipment and/or structures at the Site.

4. Between June 12 and 17, 1983 Givaudan conducted the sampling program described in paragraph 3, under the supervision of the Department.

5. On June 17, 1983, when the results of analyses of the 22 samples taken during the sampling program described in paragraph 3 became known to Givaudan, Givaudan reported to the Department that the analyses of 15 out of 22 samples taken indicated the presence of TCDD in detectable concentrations. Of

those 15 samples, 6 showed concentrations of less than 1 ppb, 8 showed concentrations of between 1 ppb and 7 ppb, and one showed a TCDD concentration in excess of 7 ppb. All samples whose analysis indicated the presence of TCDD in concentrations over 1.0 ppb were taken in the area of the Site where hexachlorophene had been manufactured (hereinafter, the "Contaminated Process Area").

6. On June 17, 1983, the Governor issued Executive Order No. 40B, extending the coverage of Executive Order No. 40 to the Site, and the Department issued Administrative Order No. EO 40B-1 (hereinafter, "the Administrative Order"), which directed, among other things, (a) that the area where TCDD contamination in concentrations equal to or in excess of 1.0 ppb had been found to be secured and covered with a tarpaulin, (b) that hexachlorophene manufacturing temporarily cease, (c) that there be no movement of waste materials or hexachlorophene from the Site without the permission of the Department, (d) that additional samples be taken on and off the Site to determine the presence or absence of TCDD contamination, (e) that demolition and construction operations on the Site temporarily cease and (f) that Givaudan supply the Commissioner of Health with certain information so that an appropriate health screening of Givaudan's employees could be conducted.

7. On June 18, 1983, a Field Investigation Team of the United States Environmental Protection Agency (hereinafter "EPA") conducted a sampling program in the area surrounding the Site. No TCDD was detected in any of the samples taken during this sampling program.

8. On June 18 and 25, 1983, Givaudan, under the supervision of the Department, conducted TCDD sampling at the Site. Of the 41 samples taken, 25 showed TCDD contamination in detectable concentrations. Of those 25 samples, 13 showed TCDD concentrations of less than 1 ppb, 11 showed TCDD concentrations of between 1 ppb and 7 ppb, and only 1 sample had TCDD present in excess of 7 ppb.

9. On July 9, 1983, Givaudan, under the supervision of the Department, conducted a TCDD sampling program including sweep and wipe sampling of the interiors of buildings on portions of the Site where hexachlorophene or TCP were being or had been manufactured. Of the 31 samples analyzed, TCDD was present in detectable concentrations in 20 samples. Of those 20 samples, 9 chip samples showed TCDD concentrations of less than 1 ppb, 4 showed TCDD concentrations of between 1 ppb and 7 ppb, one chip sample had TCDD present in excess of 7 ppb (in Building 54 where TCP is believed to have been manufactured over 35 years ago), and 6 wipe samples showed TCDD concentrations of between 1 and 7 nanograms per square foot.

10. Between July 1 and September 30, 1983, the Department of Health conducted health screenings of Givaudan's employees and found no indications of adverse health effects from any exposure those employees might have had to TCDD contamination.

11. On July 26, 1983, Givaudan provided the Department with detailed information regarding (a) the history of chemical production processes at the Site, including the production of TCP and hexachlorophene, (b) the history of operations at the Site, including by predecessor owners or operators, (c) a summary of the solid and hazardous waste and waste water disposal practices and

facilities of Givaudan, (d) the identification of all suppliers of TCP ever used or stored at the Site, (e) a summary of analytical tests performed to determine the presence or absence of TCDD contamination in TCP produced at the facility or purchased from other sources, (f) a summary of analytical testing for TCDD contamination in hexachlorophene produced by Givaudan, and (g) a summary of demolition activities which had occurred at the Site, including a description of activities formerly conducted in demolished buildings and related information.

12. On August 5, 1983, the Department requested Givaudan to submit an occupational hygiene plan to the Department of Health to prevent or minimize TCDD emissions from the hexachlorophene process buildings and on August 15, 1983, Givaudan submitted such a plan to the Department of Health.

13. On August 11, 1983, Givaudan, under the supervision of the Department, resampled Buildings 58, 59 and 60 for TCDD contamination. All samples analyzed had less than 1 ppb of TCDD.

14. On August 18, 1983, Givaudan was authorized by the Department to resume hexachlorophene production under certain conditions and Givaudan resumed hexachlorophene production in accordance with those conditions.

15. On September 8, 1983, EPA conducted additional off-site perimeter sampling for TCDD contamination. No TCDD contamination was detected.

16. On September 12, 1983, Givaudan, with the approval of the Department, conducted (a) a biased, systematic sampling program in the area of the Site around the storm water lagoon, and (b) a random sampling program around the remainder of the Site. The purpose of the random sampling program was to divide the areas of the Site other than the Contaminated Process Area into non-process areas which were to be considered contaminated by TCDD (hereinafter the "Contaminated Non-Process Area") and process and non-process areas which were to be considered not contaminated by TCDD (hereinafter the "Non-Contaminated Area").

17. On September 19, October 17 and December 1, 1983, Givaudan, under the supervision of the Department, conducted a resampling program for TCDD contamination in Buildings 58, 59 and 60. All samples analyzed had less than 1 ppb of TCDD.

18. On March 16, 1984, Givaudan submitted to the Department a proposed "TCDD Remedial Action Plan", prepared by Environmental Resources Management, Inc. (hereinafter "ERM") detailing measures Givaudan proposed to take to prevent human and environmental exposure to on-Site soils contaminated with TCDD in the Contaminated Process Area and the Contaminated Non-Process Area.

19. On April 16, 1984, Givaudan and the Department met to discuss Givaudans's "TCDD Remedial Action Plan" and Givaudan requested relief from the Administrative Order so that construction could begin on a modern, environmentally sound chemical process sewer system at the Site. On May 1, 1984, the Department submitted written comments to Givaudan on its proposed "TCDD Remedial Action Plan".

20. On May 1, 1984, the Department approved Givaudan's recommendation of a phased approach to conducting an investigation of the Site for TCDD contamination in which Phase I would address the Contaminated Process Area and Phase II would address the Contaminated Non-Process Area.

21. On May 31, 1984, Givaudan submitted to the Department a revised "Site Investigation Plan" in response to the Department's comments on Givaudan's "TCDD Remedial Action Plan". Included in Givaudan's "Site Investigation Plan" was a detailed plan for the taking of samples to determine the presence or absence of TCDD along the route of the planned chemical process sewer, located entirely outside the Contaminated Process and Contaminated Non-Process Areas.

22. On or about June 29, 1984, the Department approved those portions of the "Site Investigation Plan" which contained a plan for sampling to determine the presence or absence of TCDD (a) along the route of the planned chemical process sewer, all of which was outside the Contaminated Process and Contaminated Non-Process Areas, and (b) in the Contaminated Process and Contaminated Non-Process Areas.

23. Between July 17 and 30, 1984, the sampling program described in the preceding paragraph was executed under the supervision of the Department. At the request of the Department, split samples were taken and analyzed, at Givaudan's expense, at a separate, Department-approved laboratory to assure the accuracy of the sampling results. No TCDD contamination was detected in the samples taken along the route of the planned chemical process sewer. Of the 41 samples taken in the Contaminated Process Area, all but 1 sample had less than 1 ppb of TCDD contamination. The remaining sample had less than 6 ppb of TCDD contamination. Of the 83 samples taken in the Contaminated Non-Process Area, all but 10 had less than 7 ppb of TCDD contamination. At the request of the Department, Givaudan took 3 additional samples at the site of a filled-in former trench which was visible in an aerial photograph taken in 1950. No TCDD contamination was detected.

24. On August 17, 1984, the Department granted Givaudan permission, subject to certain conditions, to construct the new planned chemical process sewer.

25. On September 24, 1984, Givaudan requested that the Department grant relief from the Administrative Order so that Givaudan could initiate certain specific construction activities outside the Contaminated Process and Contaminated Non-Process Areas, including (a) removal of a number of storage tanks, (b) construction of a 14-foot diameter concrete pad, and (c) construction of a gravel roadway. On December 5, 1984, the Department granted permission to Givaudan to proceed with removal of the storage tanks and construction of the 14-foot diameter concrete pad, but required Givaudan to conduct additional sampling along the route of the proposed roadway before commencing construction.

26. On December 13, 1984, Givaudan requested relief from the Department from the Administrative Order so that certain curbing could be removed and the entrance to the Site from Delawanna Avenue could be enlarged and a security fence constructed at the entrance. On January 16, 1985, the Department granted Givaudan permission to proceed with the construction at the entrance to the Site.

27. On February 8, 1985, Givaudan requested relief from the Department from the Administrative Order so that additional construction projects outside the Contaminated Process and Contaminated Non-Process Areas could be commenced, including (a) demolition of two buildings located at the north end of the Site, and (b) construction of footings for a series of overhead pipe supports designed to service the renovated Site.

28. On May 17, 1985, the Department granted Givaudan permission for the construction of footings for a series of overhead pipe supports designed to service the renovated Site and approved Givaudan's proposed sampling plan to determine the presence or absence of TCDD contamination in buildings throughout the Non-Contaminated Area. The Department agreed that the Site is released from the restrictions of the Administrative Order with the exceptions of (a) the Contaminated Process Area and the Contaminated Non-Process Area, and (b) buildings located in the Non-Contaminated Area, which will be released from the restrictions of the Administrative Order upon successful completion of the sampling program and the finding that there has been no migration of TCDD contamination outside the Contaminated Process and Non-Process Areas.

29. On June 15, 1985, Givaudan, with the approval and under the supervision of the Department, conducted a chip sampling program at and around Building Nos. 44, 46/47, 51, 68, 68A and the Power Station Wall at the Site to determine whether there had been any migration of TCDD outside the defined boundaries of the Contaminated Process and Non-Process Areas.

30. During the course of the TCDD sampling program conducted by Givaudan and EPA through July 30, 1985, a total of 402 samples were analyzed for TCDD contamination. All samples analyzed as having TCDD contamination in concentrations of 1 ppb or more were located in the Contaminated Process or Contaminated Non-Process Areas. 26 samples were taken and analyzed by EPA in the area surrounding the Site, all of which were analyzed as containing no TCDD contamination in concentrations of 1 ppb or more. 329 samples were taken and analyzed by Givaudan outside the buildings located on the Site, 255 of which were analyzed as containing no TCDD contamination in concentrations of 1 ppb or more, 51 of which were analyzed as having TCDD contamination in concentrations between 1 ppb and 7 ppb, and 23 of which were analyzed as having TCDD contamination in excess of 7 ppb. 47 samples were taken and analyzed at various locations inside the buildings located on the Site, 6 of which were analyzed as having TCDD contamination in concentrations of 1 nanogram per square foot or more (none of which were analyzed as having TCDD contamination in concentrations in excess of 7 nanograms per square foot) and 41 of which were analyzed as having no TCDD contamination in concentrations of 1 nanogram per square foot or less.

31. Pursuant to New Jersey Pollutant Discharge Elimination System Permit No. NJ-0099414, effective October 1, 1982, Givaudan has discharged industrial waste water into the facilities of the Passaic Valley Sewerage Authority and has analyzed that waste water discharge for TCDD contamination on a monthly basis at a detection level at or below 1 ppb. No TCDD contamination has been detected in any of the industrial waste water discharge from the Site.

32. As a result of the investigation conducted by Givaudan under the supervision of the Department, in conjunction with EPA and the Department of Health, to determine the location and extent of TCDD contamination and the effect, if any, upon employees of Givaudan and other persons of possible exposure to that contamination, (a) the location and extent of TCDD contamination in the Contaminated Process Area has been delineated, (b) the delineation of TCDD contamination in the Contaminated Non-Process Area remains to be completed, (c) the Non-Contaminated Areas have been determined to have less than 1 ppb of TCDD contamination, (d) at this time there is no evidence that TCDD contamination has migrated off the Site, and (e) at this time there is no evidence that Givaudan employees or other persons have suffered adverse health effects from exposure to the TCDD contamination found on the Site.

33. Based on current available literature, scientists from the Center for Environmental Health of the Centers for Disease Control of the United States Public Health Service (hereinafter, "CDC") and from the United States Department of Agriculture have concluded that: (a) 1 ppb of TCDD in residential soil is a reasonable level at which to begin consideration of action to limit human exposure to contaminated soil; (b) environmental situations may vary widely, and whether a particular level of TCDD contamination in soil should give rise to concern has to be evaluated on a case-by-case basis.

34. Since the level of human exposure can be expected to be lower in non-residential areas and since other measures may be employed to restrict access and human exposure thereby controlled, the CDC and the Department have determined: (a) that soil in industrial areas contaminated with concentrations of 7 ppb or greater of TCDD should be removed and properly disposed unless removal of contaminated soil is not feasible; and (b) that when soil contaminated with concentrations of less than 7 ppb, but greater than 1 ppb, are to remain at the site, the area shall be capped, a regular monitoring program implemented, and permanent land use controls imposed.

35. Concurrently with the issuance of this Administrative Consent Order, the Department has also issued, with the consent of Givaudan, another administrative consent order, entitled "In the Matter of Givaudan Corporation - Administrative Consent Order Ground Water" (hereinafter, the "Ground Water Consent Order"), covering the investigation, delineation and remediation of ground water contamination, if any, at and/or originating from the Site.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED AND AGREED THAT:

I.

Physical Condition of the Site

36. Givaudan shall continue to maintain all areas of the Site where analytical results have indicated the presence of TCDD contamination in concentrations of 1 ppb or more in a closed and secured condition, with physical access thereto restricted. All such areas shall be covered by a permeable ground cover

installed by a contractor approved by representatives of the Department and EPA in such manner and location as may be directed by those representatives.

37. Givaudan shall not engage in any demolition, excavation, movement or disturbance of soil, or placing, movement or removal of construction materials or construction equipment in the Contaminated Process and Non-Process Areas without prior written permission from the Department.

II

Delineation of TCDD Contamination In the Contaminated Non-Process Area

38. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall submit to the Department for its review and approval, a detailed draft TCDD field sampling plan (hereinafter, the "FSP") to complete the delineation of TCDD contamination in the Contaminated Non-Process Area.

39. Within fifteen (15) days after receipt of the Department's written comments on the draft FSP, Givaudan shall modify the draft FSP as necessary to conform to the Department's comments and shall submit the modified FSP to the Department for its approval.

40. Within ninety (90) days after receiving the Department's written approval of the modified FSP, Givaudan shall conduct and complete the work described in the modified FSP and shall submit to the Department for its review and approval, a draft TCDD investigation report (hereinafter, the "Investigation Report") detailing the results, recommendations and all analytical data, developed in implementing the FSP.

41. Within fifteen (15) days after receipt of the Department's written comments on the Investigation Report, Givaudan shall modify the Investigation Report as necessary to conform to the Department's comments and shall submit the modified Investigation Report to the Department for its approval, or shall initiate such additional investigations as may be found necessary by the Department, in accordance with a schedule to be established by the Department.

III.

Feasibility Study of TCDD Contamination in the Contaminated Process and Contaminated Non-Process Areas

42. Within thirty (30) days after the approval by the Department of the Investigation Report, Givaudan shall submit to the Department for its review and approval, a draft work plan to conduct a feasibility study of remedial action alternatives for TCDD contamination in the Contaminated Process and Contaminated Non-Process Areas (hereinafter, the "TCDD Work Plan"), based on the scope of work set forth in Appendix A, which is attached hereto and made a part hereof.

43. Within fifteen (15) days after receipt of the Department's written comments on the draft TCDD Work Plan, Givaudan shall modify the draft TCDD Work Plan as necessary to conform to the Department's comments and shall submit the modified TCDD Work Plan to the Department for its approval.

44. Within seventy-five (75) days after receipt of the Department's written approval of the modified TCDD Work Plan, Givaudan shall conduct and complete the work described in the TCDD Work Plan and shall prepare and submit to the Department for its review and approval a draft TCDD feasibility study (hereinafter, the "Feasibility Study").

45. Within thirty (30) days after receipt of the Department's written comments on the draft Feasibility Study, Givaudan shall modify the draft Feasibility Study as necessary to conform to the Department's comments and shall submit the modified Feasibility Study to the Department for public hearing and approval.

46. At such time and place as the Department may establish, and upon reasonable notice to Givaudan, the Department shall conduct a public hearing with respect to the Feasibility Study. After taking into consideration any comments received at the public hearing, the Department, after consultation with Givaudan, shall select a remedial action alternative for the Site from among the remedial action alternatives described in the Feasibility Study.

IV

The Remedial Action Plan For the Contaminated
Process and Contaminated Non-Process Areas

47. Within sixty (60) days after receipt of the Department's written selection of a remedial action alternative for the Site, Givaudan shall submit to the Department for its review and approval, a detailed draft TCDD remedial action plan (hereinafter, the "Remedial Action Plan"), including a complete cost estimate for the work to be performed and a detailed schedule to implement the selected alternative.

48. Within thirty (30) days after receipt of the Department's written comments on the draft Remedial Action Plan, Givaudan shall modify the draft Remedial Action Plan as necessary to conform to the Department's comments and shall submit the modified Remedial Action Plan to the Department for its approval.

49. Upon receipt of the Department's written approval of the Remedial Action Plan, Givaudan shall conduct and complete the work described in the Remedial Action Plan in accordance with the approved schedule contained therein.

50. If the results of the Remedial Action Plan indicate that TCDD is migrating into the environment at concentration levels which constitute a significant risk to public health or the environment (a condition which is not now believed to be the case), then within ten (10) days after the discovery of any such condition, Givaudan shall submit to the Department for its review and approval, a draft amendment to the Remedial Action Plan (hereinafter the

"Remedial Action Plan Amendment"), including a complete cost estimate and an implementation schedule to correct the adverse impacts of the migration and to prevent the migration from reoccurring in the future.

51. Within ten (10) days after receipt of the Department's written comments on the draft Remedial Action Plan Amendment, Givaudan shall modify the draft Remedial Action Plan Amendment as necessary to conform to the Department's comments and shall submit the modified Remedial Action Plan Amendment to the Department for approval.

52. Upon receipt of the Department's written approval of the Remedial Action Plan Amendment, Givaudan shall conduct and complete the work described in the Remedial Action Plan Amendment in accordance with the approved schedule contained therein.

53. Prior to the preparation and implementation of any such Remedial Action Plan Amendment, and subject to the approval of the Department, Givaudan shall take such interim measures as are necessary to control or minimize the migration of TCDD contamination into the environment.

V

Project Coordination

54. All documents required by the terms of this Administrative Consent Order to be submitted by Givaudan to the Department, and all comments or approvals to be provided by the Department to Givaudan pursuant to the terms of this Administrative Consent Order, as well as all non-routine correspondence, including correspondence relating to force majeure issues, shall be sent by certified mail, return receipt requested, or shall be hand delivered and duly receipted by the recipient.

55. All correspondence, reports, work plans and other writings submitted to the Department by Givaudan with respect to this Administrative Consent Order shall be sent, unless otherwise instructed by the Department, to:

Karen Jentis, Chief
Bureau of Case Management
Division of Hazardous Waste Management
CN 028
Trenton, New Jersey 08625

56. Written communications from the Department to Givaudan with respect to this Administrative Consent Order shall be sent to:

Dr. H. A. Brandman
Vice-President-Manufacturing
Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

A copy of all such written communications shall be sent to:

William H. Hyatt, Jr., Esq.
Pitney, Hardin, Kipp & Szuch
163 Madison Avenue
CN 1945
Morristown, New Jersey 07960-1945

57. Within seven (7) days after the effective date of this Administrative Consent Order, Givaudan shall provide the Department with the name, title, address and telephone number of its designated Facility Coordinator, who shall be responsible for oversight on behalf of Givaudan of the implementation of this Administrative Consent Order, including all activities required herein. Givaudan shall have the right to change its Facility Coordinator at any time, provided Givaudan shall notify the Department in writing at least five (5) working days prior to any such change. If such advance notice is not feasible, notice shall be given to the Department by the best means and as far in advance as possible under the circumstances.

58. Givaudan shall allow the Department and its authorized representatives access to the Site at all times for the purpose of monitoring compliance with the terms of this Administrative Consent Order.

VI

Financial Requirements

A. Insurance

59. Givaudan shall use its best efforts to secure and maintain in force during the pendency of this Administrative Consent Order, a comprehensive general liability insurance policy with coverage as broad as the standard coverage form currently in use in the State of New Jersey which shall not be circumscribed by the endorsements limiting the breadth of coverage. The policy shall include an endorsement (broad form) for contractual liability, an endorsement for completed operations liability, an endorsement of Broad Form Property Damage Coverage and an endorsement for independent contractors coverage. Givaudan shall use its best efforts to have its underwriter(s) add and maintain the State of New Jersey as an additional insured through completion of the Remedial Action Plan to be implemented pursuant to this Administrative Consent Order. The policy shall be specifically endorsed to eliminate any exclusions for explosion, collapse and underground hazards (x,c,u). Limits of liability shall be not less than Six Million Dollars ($6,000,000.00) per occurrence and annual aggregate for bodily injury and for property damage combined.

60. If Givaudan is able to obtain the insurance policy described in paragraph 59 above, as soon thereafter as that insurance policy described in the preceding paragraph can be obtained by Givaudan, Givaudan shall provide the Department with a current certificate of insurance certifying coverage. The certificate shall contain a provision that the insurance shall not be cancelled for any reason except after thirty (30) days written notice to the Department.

61. If Givaudan is not able to obtain or maintain the insurance policy described in paragraph 59 above, Givaudan shall indemnify the State to the same extent that the insurance coverage would have provided the State as an additional insured.

B. Financial Assurance

62. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall obtain and provide to the Department an irrevocable, conditional letter of credit in the amount of One Million Dollars ($1,000,000) (hereinafter, the "Letter of Credit") to secure performance of all its obligations under this Administrative Consent Order and under the Ground Water Consent Order. The Letter of Credit shall be issued by a New Jersey bank or financial institution, or by such other bank or financial institution as shall be approved by the Department. Subject to the provisions of paragraph 64 and 65 of this Administrative Consent Order, Givaudan shall maintain the Letter of Credit continuously in full force and effect until the requirements of this Administrative Consent Order and the Ground Water Consent Order have been completed.

63. The amount of the Letter of Credit has been determined by estimating the costs of implementing the requirements of this Administrative Consent Order and the requirements of the Ground Water Consent Order.

64. The Letter of Credit shall be conditioned that in the event the Department determines that Givaudan has failed to perform any of its obligations under this Administrative Consent Order or the Ground Water Consent Order, the Department may draw on the Letter of Credit; provided, however, that before any such draw can be made, the Department shall notify Givaudan in writing of the obligation(s) with which Givaudan has failed to comply, and Givaudan shall have a reasonable time, not to exceed thirty (30) days, to perform any such obligation(s).

65. If the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the Ground Water Consent Order at any time exceeds the amount of the Letter of Credit, Givaudan shall promptly cause the amount of the Letter of Credit to be increased so that the amount of the Letter of Credit is equal to the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the Ground Water Consent Order.

66. At any time during the performance of its obligations hereunder, Givaudan may apply to the Department for approval to reduce the amount of the Letter of Credit to reflect the remaining estimated combined costs of performing its obligations under this Administrative Consent Order and the Ground Water Consent Order, or to substitute other financial assurance in a form and manner acceptable to the Department.

67. Givaudan shall increase the amount of the Letter of Credit, or other approved financial assurance, within fifteen (15) days of its receipt of a written notice from the Department, to reflect increases in the estimated cost of implementing the approved remedial action alternative.

C. Reimbursement of Costs.

68. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall issue a certified check to the Department in the amount of Thirteen Thousand One Hundred Sixty-Six Dollars and Thirty-Three Cents ($13,166.33). Payment by Givaudan of this sum shall represent reimbursement in full and complete satisfaction of any claims the Department may have against Givaudan for expenses incurred up until the effective date of this Administrative Consent Order as a result of the Department's investigation and remediation of TCDD contamination at the Givaudan Plant or the Site.

69. Subject to the limitations and reservations of rights contained in this paragraph, Givaudan agrees to reimburse the Department for the Department's reasonable oversight costs incurred in connection with this Administrative Consent Order and the Ground Water Consent Order, by submitting to the Department, within 30 days after receipt by Givaudan of an itemized accounting of such costs, a certified check, drawn to the order of the Treasurer, State of New Jersey, in the full amount of such costs. Givaudan agrees to reimburse the Department for all such oversight costs up to $100,000.00. The Department reserves its right to seek recovery from Givaudan of such oversight costs in excess of $100,000 and Givaudan reserves its right to contest its obligation to reimburse the Department for any such oversight costs in excess of $100,000.00.

VII

Force Majeure

70. If any event occurs which Givaudan believes will or may cause delay in the achievement of any deadline prescribed by this Administrative Consent Order, Givaudan shall notify the Department in writing within seven (7) days of the delay or anticipated delay, as appropriate, referencing this paragraph and describing the anticipated length of the delay, the precise cause or causes of the delay, any measures taken or to be taken to minimize the delay and the time required to take any such measures to minimize the delay. Givaudan shall adopt all necessary measures to prevent or minimize any such delay. Givaudan's failure to comply with the notice requirements of this paragraph shall render this force majeure provision void as to the particular incident involved.

71. If the Department finds that any delay or anticipated delay has been or will be caused by fire, flood, riot, strike or other circumstances reasonably beyond the control of Givaudan, the Department shall extend the time for performance hereunder for a period no longer than the delay resulting from such circumstances. If, however, the event causing the delay is found by the Department not to be beyond the control of Givaudan, failure to comply with the provisions of this Administrative Consent Order shall not be excused as provided herein and shall constitute a breach of the requirements of this Administrative Consent Order. The burden of proving that any delay is caused by circumstances beyond the control of Givaudan and the length of any such delay attributable to those circumstancees shall rest with Givaudan. Increases in the cost or expenses incurred by Givaudan in fulfilling the requirements of this Administrative Consent Order shall not be a basis for an extension of time. A delay by Givaudan

in completing an interim requirement of this Administrative Consent Order shall not automatically extend the time for performance by Givaudan of the remaining requirements of this Administrative Consent Order.

VIII
Reservation of Rights

72. This Administrative Consent Order shall be fully enforceable in the New Jersey Superior Court upon the filing of a summary action for compliance pursuant to Executive Order No. 40 (1983) signed by Governor Thomas H. Kean on June 2, 1983, N.J.S.A. App. A:9-45, N.J.S.A. 13:1D-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.

73. This Administrative Consent Order may be enforced in the same manner as an Administrative Order issued by the Department pursuant to these same statutory authorities.

74. Nothing in this Administrative Consent Order shall constitute a waiver of any statutory right of the Department pertaining to any of the laws of the State of New Jersey, should the Department determine that additional remedial actions are necessary to protect the public health or the environment.

75. In consenting to this Administrative Consent Order and/or by complying with its provisions and requirements, whether directly or through an agent or contractor, Givaudan neither admits nor denies the Findings made herein and admits no liability or responsibility to the Department or to any other party, entity or person. This Administrative Consent Order shall not constitute or be used as evidence of any admission of law or fact against Givaudan.

IX

General Provisions

76. This Administrative Consent Order shall supersede the Administrative Order.

77. The provisions of this Administrative Consent Order shall be binding on Givaudan, its principals, agents, employees, successors, assigns, tenants and any trustee in bankruptcy or receiver appointed pursuant to a proceeding in law or equity.

78. No obligations imposed by this Administrative Consent Order (with the exception of paragraphs 68 and 69) are intended to constitute a debt, claim, penalty or other civil action which should be limited or discharged in a bankruptcy proceeding. All obligations imposed by this Administrative Consent Order shall constitute continuing regulatory obligations imposed pursuant to the police powers of the State of New Jersey, intended to protect the public health and the environment.

79. Compliance with the terms of this Administrative Consent Order shall not excuse Givaudan from compliance with any applicable federal and state permits, statutes and regulations while carrying out the obligations imposed by this Administrative Consent Order.

80. Givaudan shall make available to the Department all data and information, including raw sampling and monitoring data, generated pursuant to this Administrative Consent Order.

81. Givaudan shall not construe any informal advice, guidance, suggestions, or comments by the Department, or by persons acting on behalf of the Department, as relieving Givaudan of its obligation to obtain written approvals as may be required herein, unless such advice, guidance, suggestions, or comments by the Department shall be submitted in writing to Givaudan pursuant to paragraph 54, except for minor modifications during field activities, including minor scheduling adjustments, which Givaudan shall confirm in writing to the Department.

82. No modification or waiver of this Administrative Consent Order shall be valid except by written amendment to this Administrative Consent Order duly executed by Givaudan and the Department.

83. When this Administrative Consent Order becomes effective, Givaudan waives its right to a hearing on the matters contained herein, pursuant to N.J.S.A. 52:14B-1 _et seq_. and N.J.S.A. 58:10A-1 _et seq_.

84. The requirements of this Administrative Consent Order shall be deemed satisfied upon the receipt by Givaudan of written notice from the Department that Givaudan has demonstrated, to the satisfaction of the Department, that all the terms of this Administrative Consent Order have been completed.

85. This Administrative Consent Order shall take effect upon the signature of both parties.

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

3/5/87
DATE

Richard T. Dewling
Commissioner

Approved as to form
2/25/87

Witness:
Michael L. Catanese

GIVAUDAN CORPORATION

3/5/87
DATE
GFS

Witness:

NAME H A Brandvan
TITLE V.P. Operations
NAME
TITLE SR. VICE PRESIDENT

APPENDIX A

FEASIBILITY STUDY

A. Objectives

1. identify and evaluate all potentially viable remedial action alternatives for the TCDD contamination on and/or emanating from the Site

2. recommend the remedial action alternative best suited to remove all concentrations of TCDD on and/or emanating from the Site so that the levels remaining following removal do not exceed 7 parts per billion, provided, however, that the recommended remedial action alternative shall ensure that the potential for human exposure to, or migration into the environment of TCDD at levels of 1 part per billion, or greater, is eliminated to the maximum extent technically practicable;

3. The Feasibility Study shall propose remedial action alternatives for remediation of the TCDD contamination located in the Contaminated Process and Contaminated Non-Process Areas. For material contaminated with TCDD in concentrations of less than 7 ppb, the remedial action alternatives may include containment of the contaminated material in place or elsewhere on the Site, provided that any such proposed remedial action alternative (a) precludes the likelihood of significant future exposure to the contaminated material, (b) ensures that erosion will not eventually uncover the contaminated material and (c) ensures that further use of the Site will be monitored to prevent disturbances of the contaminated material which might cause an unacceptable human exposure at a future date. Unless the exception of the following sentence applies, the remedial action alternatives shall provide for the removal from the Site and proper disposal of material contaminated with TCDD in concentrations of 7 ppb or greater. If the Feasibility Study concludes, and the Department agrees, that the removal of material contaminated with TCDD in concentrations of 7 ppb or greater from the Site is not practicable, then the draft Feasibility Study shall recommend the remedial action alternative deemed best suited to contain the TCDD contamination on-Site in such a manner that the potential for human contact with the TCDD contamination or for migration of the TCDD contamination into the environment is and will be eliminated to the maximum extent technically practicable. Furthermore, if the recommended remedial alternative requires concentrations of TCDD greater than 1 ppb to remain on site, then the alternative shall include capping, regular monitoring, and the imposition of permanent land use controls.

B. Identification of Remedial Alternatives

1. develop alternatives to incorporate remedial technologies, response objectives and criteria, and other appropriate considerations into a comprehensive, site-specific approach

2. consider all appropriate remedial alternatives including but not limited to on-site remediation, containment, and no-action options

3. screen all potentially viable remedial action alternatives to narrow the list of potential alternatives for further detailed analysis, according to the following:

   a. environmental and public health impacts

   b. engineering feasibility and reliability

   c. cost, including operation and maintenance costs

4. evaluate the limited number of alternatives that remain after the initial screening according to the following:

   a. describe appropriate treatment and disposal technologies, as well as any permanent facilities required

   b. specify engineering considerations required to implement the alternative (e.g., treatability study, pilot treatment facility, additional studies needed to proceed with final remedial design)

   c. describe environmental and public health impacts and propose methods for mitigating any adverse effects

   d. operation and maintenance/monitoring requirements of the completed remedy

   e. off-site disposal needs and transportation plans

   f. temporary storage requirements

   g. requirements for health and safety plans during remedial implementation (including both on-site and off-site health and safety considerations)

   h. describe how the alternative could be phased into individual operable units including how various components of the remedy could be implemented individually, or in groups resulting in a functional phase of the overall remedy

   i. describe how the alternative could be segmented into areas to allow implementation of differing phases of the alternative

j. a review, provided by the Department of any off-site storage, treatment or disposal facility to ensure compliance with applicable hazardous waste regulatory requirements

k. describe which federal, state and local permits would be necessary for each alternative identified and the information necessary for the development of each of the permits

l. time required for implementation, including interim dates of significance

C. Evaluation of Alternatives

1. evaluate and present the alternative remedies identified in Part B above and recommend the most environmentally sound alternative(s)

   a. develop a health and environmental assessment

      i. evaluate each alternative considering environmental fate, exposure and associated health and environmental effects

      ii. analyze mitigating adverse effects, and physical or legal constraints

   b. develop a detailed cost summary for each remedial action alternative, and for each phase or segment of the alternative

      i. present the cost as a present-worth cost

      ii. include total cost of implementing the alternative including the annual operation and maintenance costs of the alternative for the full duration of the alternative

   c. evaluate each alternative in accordance with the criteria established in Part A above

      i. apply the evaluation criteria uniformly to each alternative

      ii. identify a number of remedial alternatives that are comparable

      iii. identify the most appropriate alternative, given the specific constraints of the project

      iv. prepare a trade-off matrix that enables identification of now comparable techniques including

         - level of cleanup achievable

         - time to achieve cleanup

- feasibility
- implementability
- reliability
- ability to minimize adverse impacts during action
- ability to minimize off-site impacts caused by action
- remoteness of activities
- useability of ground water
- useability of surface water
- useability of site

d. recommend the alternative that is the most environmentally sound resulting from Sections II. C.1.b. and C.1.c.

  i. prepare rationale for recommending the selected alternative stating the advantages over other alternatives considered

  ii. a conceptual design of the recommended alternative should be included, providing, as a minimum, the following information:

    - the selected engineering approach with implementation schedule
    - any special implementation requirements
    - applicable design criteria
    - preliminary site layouts
    - estimates of all costs, including operation and maintenance requirements
    - safety plan

The following communications were read.

From the Township Engineer, calling the attention of the Township Committee to the fact that the trunk sewer through the Township is nearing completion and in order to properly provide inlets for the proposed sewer system, it is necessary to proceed at once to make preliminary plans. Accompanying the letter is a map showing the inlets provided by the Trunk Sewer Commission. You will note that they are few; however, the Commission has consented to add any extra inlets, in the uncompleted portion, that you may desire.

Upon motion it was refered to the Road Committee.

From Hawkins, Delafield and Longfellow, Attorneys at Law, stating that as the financial market has improved and that several municipalities have sold their bonds for a good price, they requested to know if the Township Committee wished them to proceed to prepare the necessary forms and ordinances for the issue of the $30,000.00 municipal bonds.

Upon motion the Clerk was directed to notify them to prepare the necessary forms and ordinance.

The following resolutions were adopted.

RESOLVED; That the application of the New Jersey Bus Co. for a license to operate motor buses, within the Township, be and the same hereby is granted and the Clerk be and he is hereby directed to notify said Company to appear and pay the fee as provided by ordinance on or before Friday the 8th. inst.

RESOLVED; That the Township Treasurer pay the salaries of the members of the Police Dept. monthly, upon a pay roll, to be signed by the Chairman of the Township Committee, the Township Clerk and the Chief of Police.

RESOLVED; That the Township Treasurer pay the salaries of the following officials, to wit, the Collector of Taxes, Assessor of Taxes, Township Clerk, Treasurer, Township Physician, Overseer of the Poor and Janitor upon a monthly pay roll to be signed by the Chairman of the Township Committee and the Township Clerk.

Whereas, by the terms of two certain contracts executed according to law, between the Township of Acquackanonk, in the County of Passaic, and certain other municipalities, lying in whole or in part within the Passaic Valley Sewerage District and the Passaic Valley Sewerage Commissioners, one of which contracts bears date the fifteenth day of May, one thousand nine hundred and eleven, and the other of which supplementing and confirming the same, bears date the twentieth day of September, one thousand nine hundred and eleven, the said Township of Acquackanonk, in the County of

Clifton, N.J., June 6, 1916.

The regular meeting of the Township Committee of the Township of Acquackanonk was held on the above date, all the Committeemen were present.

The minutes of the previous meeting were read and approved.

The following reports of officials were upon motion refered to the F Committee.

Treasurers report, balance from last report $25,660.21, receipts $387. disbursements $8761.62, balance $17,286.34.

Overseer of the Poor report, Balance from last report $190.49, receipts $80.00, total $270.49, disbursements $223.66, balance $$46.83.

Building Inspectors report, permits issued for the month of May, 1916 amounted to the sum of $66.00 and he placed the total value of constr tion at $30,00

The Foreman of Roads reported that about the 1st. of May, 1916, the Cedar Cemetery Co. caused to be erected along the easterly side of Lake Vie Ave., a substancial wire fence, a portion of said fence being built up and across the right of way of Crooks Ave., for a distance of about 2 north of the southerly boundary of said Avenue, a distance of about 1 feet, thence southerly about 26 feet to the southerly boundary line of Crooks Ave., thereby causing an obstruction in said Crooks Ave., within the Township of Acquackanonk without authority from the Township Com tee.

Upon motion it was refered to the Counsel and Engineer.

A communication was read from the Passaic Valley Sewerage Commission stating that they were making application to the Board of Commerce & igation for a permit authorizing the construction of pipe lines ben the Passaic River, from Yantacaw St., in the Township, at the Passaic R to Riverside Ave., in the Township of Union and they requested the To Committee to grant them a permit, according to the following resoluti to lay their pipe lines beneath the Passaic River between the points mentioned.

BE IT RESOLVED; that permission be and is hereby granted to Passaic Val Sewerage Commissioners to construct, maintain and operate cast iron si pipes extending from the end of Yantacaw St., in Acquackanonk Township at the Passaic River, to Riverside Ave. Union Township; said cast iron si pipes being part of the intersecting sewer and branches planned to be constructed by the Passaic Valley Sewerage Commissioners for the Town ship of Acquackanonk and other municipalities in the Passaic Valley erage District.

This Formal consent is given for submission by the Passaic Valley Sewerage Commissioners to the New Jersey Board of Commerce & Navigation, for the purpose of securing the necessary permit from the said Board for the construction of the said cast iron siphon pipe lines.

The above resolution was adopted.

Applications.

From the Secretary of Lake View Fire Co.#9stating that A.Van.Zorge and C.Wolstenholme were elected active members of the Company.

Upon motion the Township Committee accepted their membership as active members of Fire Co.#9,and the Clerk was directed to enter thair names on the Township Firemens register.

From A.Friedman and Abram Kurlantzick,respectively for automobile bus licenses.

Upon motion the Clerk was directed to grant them licenses.

Upon motion the Chairman and Clerk were directed to execute the following deed.

A deed given by the Township to Wm.DeLorenzo of the Town of Hackensack, for a consideration of $10.63 for the premises known as 1.lot,lot #48 South Ave.,block #68,Clifton,N.J.

The following named ordinance had its third and final reading by title, upon motion all the Committeemen voting in the affirmative on roll call the ordinance was adopted.

An ordinance to establish the grade of Maple Place,between Union Ave. and Barkley Ave.

The following bills were reported correct by the Finance Committee and ordered paid;Passaic Herald $68.22,News Publishing Co.$63.30,National Electric Co.Inc.$4.03,J.J.Slater,County Clerk $5.11,F.A.McBride Co. $550.00,P.S.Van Kirk Co.$600.00,Bergen Auto Co.$817.50,B.Todaro $267.75, Pay Roll for labor and teams for repairing township roads from May 16th, to June 5th,inclusive $250.00,Pay Roll for labor collecting ashes and garbage from May 16th,to June 5th,inclusive $36.00,L.C.Randall,Agent, $23.50,Ira Hortsma $3.25 and Henry Belden $60.00.

The following bills were refered to the Finance Committee;John A.Doolittle $24.75,Jas.S.Cocker $3.25 and $3.80,Gulf Refining Co.$29.87,W.H.Beck $36.00,Union Building & Construction Co.$39.95 and Underwood Typewriter Co.$41.50. Upon motion meeting adjourned.

Edo M. Yereance,
Township Clerk.

Clifton,N.J.,March 20,1917.

The regular meeting of the Township Committee of the Township of Acquackanonk was held on the above date,all the Committeemen were present.

The minutes of the previous meeting were read and approved.

The following communications were read.

From the Secretary of Clifton Fire Co.#2,stating that Mr.Cornelius Quadland has resigned from the Company and he requested that his name be stricken from the Township firemens register.

Upon motion the request was granted

From W.Johnston,Assistant Engineer of the Delaware,Lackawanna & Western Railroad,stating that in a recent conversation with Committeeman Geo. F.Schmidt,he enclosed with the communication a blue print of their plan dated May 16th,1916,on which is indicated a proposed scheme for the elimination of the grade crossing their tracks and Clifton Boulevard,located some 500 feet north of their Athenia station and the Company would be pleased to negotiate with the Committee with a view of entering into an agreement providing for the changes shown on the plan and he requested that the matter be brought before the Committee and he would be glad to furnish additional information or go over the situation on the ground if the Committee desires.

Upon motion it was refered to the Road Committee.

From Garwood Ferguson,County Engineer,stating that at a joint meeting of the Board of Freeholders,Acquackanonk Township and the City of Passaic,relative to the elimination of flood conditions of the Weasel Brook would be held at the Court House,Wednesday,March 28th.at 2:30 p.m. at the office of the Clerk and he requested that the Township Committee and the Engineer attend the meeting.

Upon motion it was refered to the Finance Committee.

From the Passaic Valley Sewerage Commissioners urgeing upon the municipalities the importance of making early disposition of the proposed suppplemental contract submitted by the Commissioners in November,1916, and without an additional appropriation the Commissioners would be unable to enter into the necessary contracts for the completion of the work. The causes that have made an additional appropriation necessary are set out at length and in detail in the communication of November,1916. About 85% of the work is completed,involving the expenditure of approximately of $11,000,000. The justification of this expenditure would be the benefit to the Passaic Valley by the operation of the sewer upon its completion. Until its completion no compensation will be re[...]ed by the municipalities which have paid this large sum of money, and loss in interest is plainly a matter of very serious importance. Business prudence would therefore seem to demand that the construction of the intercepting sewer be pressed to the earliest possible conclu[...] With the early execution of the supplemental contract it will be pos[...] to complete the intercepting sewer and put it into operation by the [...] of the year 1918, if this is delayed much longer, so that the constru[...] of the second section under New York Bay cannot be resumed at the beg[...]ning of the working season and it would be impossible to complete th[...] sewer within the time named.

Upon motion it was refered to the Counsel.

A copy of a communication from the Richardson Scale Co. to the Delaware Lackawanna & Western Railroad Co. was read and it stated that the Mag[...] Car Co. was arrangeing for further siding accomodations and they thou[...] that the matter should be taken up, as suggested, with the authorities [...] Acquackanonk Township. They stated that they had already made an [...]plication to the Township regarding the lease of a small piece of Col[...] Ave., but had not received any official advise that this had been al[...]ed, although there seems to be a general opinion that Colfax Ave., as [...] way should be abandoned, in any case, it is a cul-de-sac and the only [...]ision that is given to us by the Standard Oil Cloth Co., who owns th[...] on the other side of the Railroad, is one which permits for a foot-wa[...] over their land, and in the same way that the railroad has made prov[...] for operatives on that side of the track to cross over to Passaic f[...] other mills, it is reasonable to expect that when their part becomes [...] developed, that similar facilities will be provided for the people, fo[...] would be unreasonable to expect them to travel half a mile towards [...] in order to get over the Railroad and there is no means of travel ov[...] the present foot bridges, owing to the propetty of the Magor Car Co. [...]ing off the means of access to the said bridge. There would pro[...] be at least ten tracks crossing Colfax Ave. and the closing of this [...] save to those particular works interested in the crossing, it would [...] to be a fair and equitable arrangement, providing that there be left [...] means of access to the proposed footbridge arranged 18 foot over the [...] tracks. The cost of such overhead access should be borne by the [...] and the Township.

Upon motion it was refered 0938 the Road Committee.

EPA-600/2-80-197
November 1980

DIOXINS

M.P. Esposito, T.O. Tiernan, and
Forrest E. Dryden

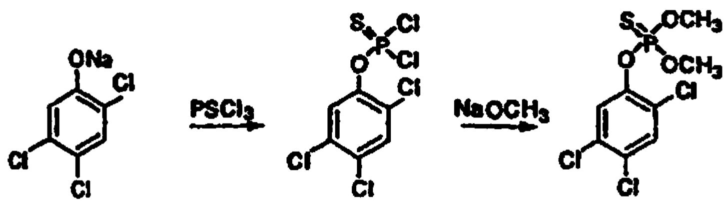
Contract Nos. 68-03-2577
68-03-2659
68-03-2579

Project Officer
David R. Watkins
Industrial Pollution Control Division
Industrial Environmental Research Laboratory
Cincinnati, Ohio 45268

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

Ronnel is effective in the control of roaches, flies, screw worms, and cattle grubs (Merck Index 1978). In 1972, highly chlorinated dioxins were detected at ppm levels in an unknown number of ronnel samples (Woolson, Thomas, and Ensor 1972).

The manufacture of ronnel is a two-step process (U.S. Patent Office 1952) in which Na-2,4,5-TCP is reacted first with thiophosphoryl chloride, then with sodium methoxide. The chemical reactions are shown below:



Na-2,4,5-TCP RONNEL

In the first step, dry Na-2,4,5-TCP is added to an excess of thiophosphoryl chloride (2 to 4 times the theoretical amount) and heated slightly, perhaps to 80° C. Sodium chloride is formed as an insoluble precipitate; it is filtered from the mixture and discarded. The clear filtrate is vacuum-distilled to recover the excess thiophosphoryl chloride for recycle and to fractionally separate the intermediate from side reaction impurities.

In a separate reaction vessel, metallic sodium is mixed with methanol. Hydrogen gas is liberated, creating a methanolic solution of sodium methoxide. This solution is mixed slowly with the purified intermediate while the mixture is maintained at approximately room temperature with noncontact cooling water.

When measured amounts of both reactants have been combined, the mixture is held for a period of time to ensure completion of the reaction. A nonreactive organic solvent is then used to extract the product from a mixture of methanol, excess sodium methoxide, and byproduct sodium chloride. Suitable extraction solvents are carbon tetrachloride, methylene dichloride, and diethyl ether. The extraction solvent is decanted from the mixture, washed with water solutions of sodium hydroxide, and fractionally vacuum-distilled to separate the extraction solvent for recycle and to separate ronnel from side reaction byproducts.

Throughout this process, the temperature probably does not exceed 150° C. The highest temperature probably occurs in the base of the final distillation column. In theory, additional dioxins are not likely to be created by this process because of the absence of high temperature and pressure, although all other conditions meet the requirements for formation of 2,3,7,8-TCDD (see Figure 15, p. 61).

It appears even less likely that dioxins originally present in the Na-2,4,5-TCP raw material would be carried through into the product. If all the steps outlined above are properly conducted, some of the operations might isolate dioxins into waste streams. The solubility of dioxins in thiophosphoryl chloride is unknown; if they are insoluble, they would be removed with the first filtration. Because the solubility of dioxins in chlorinated methanes is very slight (0.37 g/liter for TCDD in chloroform), much of the dioxin present would not be captured by the extraction solvent and would be carried away with the methanol reaction solvent. Distillations afford two other opportunities to isolate dioxin contaminants into waste organic fractions. Although the probability of dioxins carrying through into the final product appears slight, definitive information is not recorded.

Ronnel is reportedly produced by only one company—Dow Chemical Company, Midland, Michigan (Stanford Research Institute 1978). Annual production volume is not known. It is found in over 300 pesticide formulations registered by more than 100 companies.

Chlorophenol Derivatives with Unconfirmed Dioxin Content

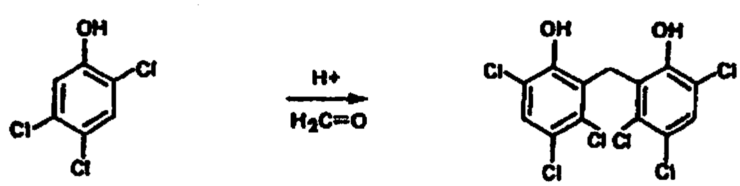
This subsection deals with several other chlorophenol derivatives that may contain dioxins. The compounds discussed include those that have been analyzed for dioxin content with negative results and also those for which analytical data have not been reported.

Hexachlorophene—

Hexachlorophene is known chemically as either bis-(3,4,6-trichloro-2-hydroxyphenyl) methane, or 2,2'-methylene-bis (3,4,6-trichlorophenol). It is also known commercially as G-11 (Cosmetic, Toiletry, and Fragrance Association, Inc. 1977). Hexachlorophene is an effective bactericide and fungicide. Prior to 1972 it was widely advertised and distributed as an active constituent of popular skin cleansers, soaps, shampoos, deodorants, creams, and toothpastes (Wade 1971; U.S. Dept. HEW 1978). Although its use has been considerably restricted by the Food and Drug Administration, it still may be used as a preservative for cosmetics and over-the-counter drugs; the concentration is restricted to 0.1 percent in these products. Skin cleansers containing higher levels may also be sold but only as ethical pharmaceuticals, available by medical prescriptions (U.S. Code of Federal Regulations Title 21 1978). As an agricultural pesticide, hexachlorophene is a constituent of formulations used on three vegetables and on some ornamental plants for control of mildew and bacterial spot. It is also used in limited industrial and household applications as a disinfectant.

The grade of hexachlorophene produced today is reported to contain less than 15 μg/kg (< 15ppb) 2,3,7,8-TCDD (World Health Organization 1977). In a 1972 analysis, dioxins could not be detected in hexachlorophene at a detection limit of 0.5 mg/kg (0.5 ppm) (Helling et al. 1973).

Four process patents have been issued on manufacture of hexachlorophene, and all are variations of the following chemical reaction:



2,4,5-TCP HEXACHLOROPHENE

Hexachlorophene is formed by reacting one molecule of formaldehyde with two molecules of 2,4,5-TCP at elevated temperatures in the presence of an acid catalyst (Moye 1972). The patented processes differ in temperature, reaction time, order of reagent additions, reaction solvents, and other physical parameters.

In the first process, patented in 1941, methanol is the solvent and large amounts of concentrated sulfuric acid are used to bind the water that is formed as a reaction byproduct; the process takes place at 0° to 5° C over a 24-hour period (U.S. Patent Office 1941). A second patent issued in 1948 discloses that the methanol solvent is eliminated and the reaction is conducted with paraformaldehyde at an elevated temperature (135° C) over a 30-minute period (U.S. Patent Office 1948). A 1957 patent reintroduces a solvent, which is one of several chlorinated hydrocarbons (U.S. Patent Office 1957d). Temperature is 50° to 100° C, and reaction time is 2 to 3 hours. Oleum (sulfuric acid plus SO_3) is used as the catalyst and concentrated sulfuric acid is recovered as the byproduct. Finally, a 1971 patent revises the order of reagent addition and also emphasizes the chemical reaction mechanism (U.S. Patent Office 1971). This last-mentioned process is probably the one in present use; its processing sequence is shown in Figure 32.

Patent information indicates that older manufacturing methods probably reclaimed the product from the reaction mixture by neutralizing the sulfuric acid with sodium hydroxide, which would have created a rather large amount of brine waste. In modern processes, conditions are probably maintained so that the residual sulfuric acid separates as a distinct liquid layer when agitation of the mixture is stopped after completion of the reaction. This acid, which contains the water formed during the reaction, is decanted from the mixture; it is strong enough to be used elsewhere in the plant complex, although it probably cannot be used in subsequent hexachlorophene batches.

In the patent examples, the organic layer that remains after the acid is removed is mixed with activated carbon, which is then filtered from solution. The purpose of this treatment is to remove colored impurities. The clear filtrate is then chilled to approximately 0° C; crystals of hexachlorophene precipitate and are filtered from solution, dried, and packaged. The filtrate, which would contain some hexachlorophene, is probably directly recycled for use in succeeding batches.

There is no indication that dioxins would be formed during the production of hexachlorophene, since highly acidic conditions are maintained throughout the process and temperatures are well below those known to be needed for dioxin reactions (Kimbrough 1974). If dioxins are found in hexachlorophene, the most likely explanation for their presence is that contamination in the 2,4,5-TCP raw material is carried through into the final product (see Figure 27, p.74). In a situation identical to that of the 2,4,5-T process, the patent descriptions show the possibility of activated carbon adsorption, which could cause accumulation of dioxins into an extremely hazardous waste. If carbon adsorption is not used in commercial practice or if it is not totally effective, any dioxins in the raw material will either appear in the hexachlorophene product or be recycled to succeeding batches. Although dioxins are not known to be soluble in sulfuric acid, they might be carried out of the process with the acid byproduct; if this were the case, dioxins could then appear in other products of the plant in which the sulfuric acid is utilized.

Givaudan Corporation in Clifton, New Jersey, is apparently the only active U.S. producer of hexachlorophene. Until 1976, the 2,4,5-TCP for hexachlorophene manufacture was produced by Givaudan's ICMESA plant in Seveso, Italy, and shipped to New Jersey for conversion. In 1976, Wright State University analyzed two representative samples of this trichlorophenol and found 1.8 and 1.9 ppb TCDD's (Tiernan 1976). An accident in 1976 closed the ICMESA plant and eliminated Givaudan's primary supply of 2,4,5-TCP. (For further details of the ICMESA incident see Section 5, p. 168). It is now believed that all the 2,4,5-TCP for hexachlorophene manufacture is supplied by Dow Chemical Company and that Givaudan specifies an extremely low dioxin content. In 1978, five waste samples from the Clifton plant were analyzed for chlorinated dioxins. None were found at a 0.1 ppm level of detection (U.S. Environmental Protection Agency 1978d). Subsequent analysis of three of these samples found no TCDD's at 0.1 or less ppb (see Section 4 of this report).

About 400 commercial products containing hexachlorophene have been marketed recently in pesticide, drug, cosmetic, and other germicidal formulations. The annual production volume of the germicide is not reported.

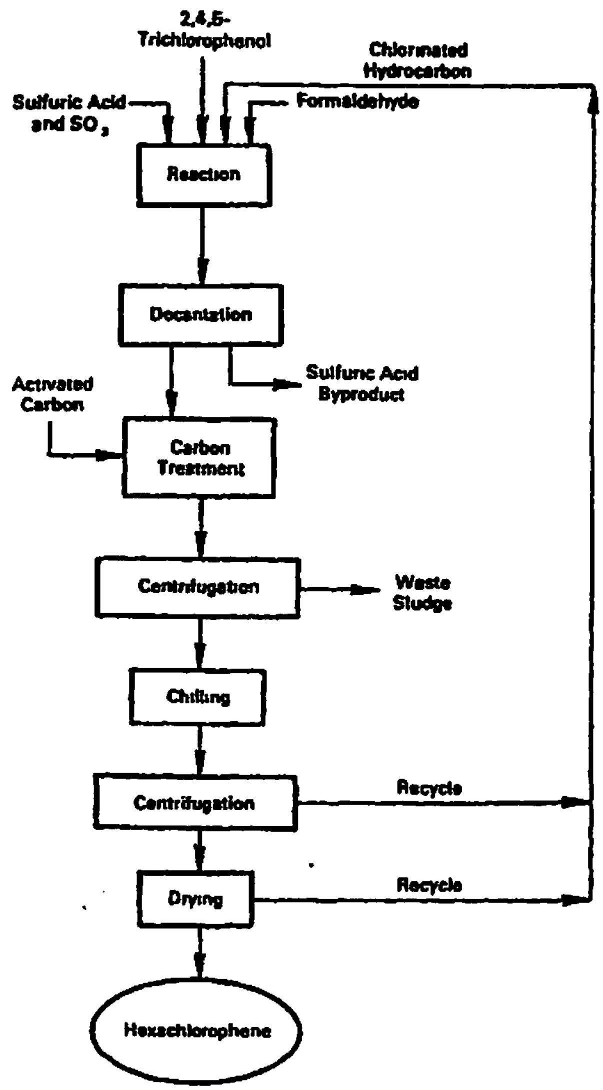
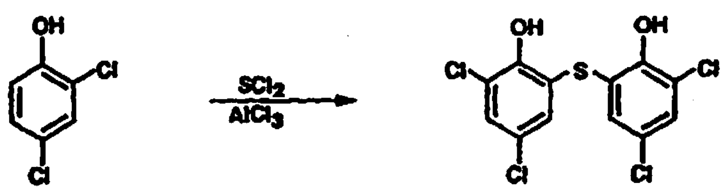


Figure 32. Flow chart for hexachlorophene manufacture

Bithionol—

Bithionol (2,2'-thio-bis[4,6-dichlorophenol]) is an antimicrobial agent that was approved at one time for drug use by the U.S. Food and Drug Administration. This approval was withdrawn in October 1967 because the chemical was found to produce photosensitivity among users (Kimbrough 1974; Merck Index 1978). The U.S. EPA continues to approve its use as a pesticide in three animal shampoo formulations. These formulated bithionol products may no longer be actively marketed, however, because the single basic source of this chemical (Sterling Drug's Hilton-Davis Chemical Co.) apparently no longer produces it (Chem Sources 1975; Stanford Research Institute 1978).

The manufacture of bithionol is a one-step reaction between 2,4-dichlorophenol and sulfur dichloride (U.S. Patent Office 1962; U.S. Patent Office 1958b). Carbon tetrachloride is used as the solvent, and a small amount of aluminum chloride serves as the catalyst. Bithionol is formed in a reaction at about 50° C; batch time is about 2 hours. The chemical reaction is shown below.



BITHIONOL

Two methods of product recovery are outlined in one process patent (U.S. Patent Office 1958b). In one method, water is added and impure bithionol precipitates. To form a crude product, it is necessary only to filter the solids from the mixture and wash them several times in water and cold carbon tetrachloride. They are then dried and packaged.

Alternatively, to recover a purified product, water is added and the mixture is distilled to remove the carbon tetrachloride for recycle. Bithionol collects as an organic sediment, which is separated from the water solution by decantation, washed with water and sodium bicarbonate, vacuum-dried, redissolved in hot chlorobenzene, filtered, chilled to precipitate bithionol, and again filtered.

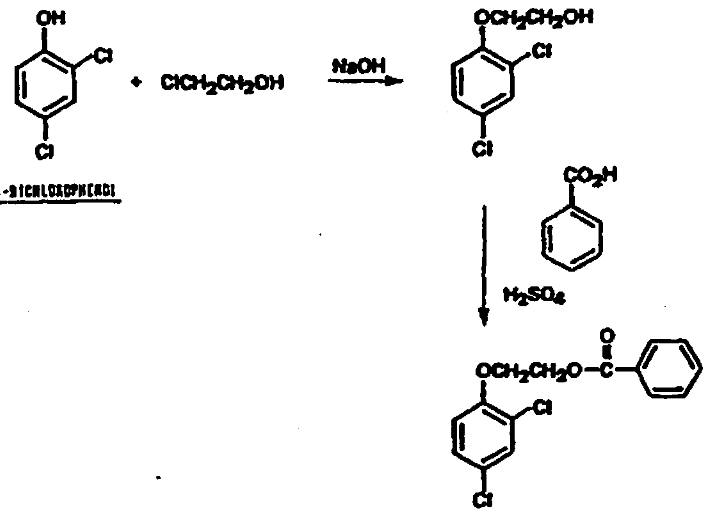
A separate patent outlines a procedure for forming metallic salts of bithionol, which are compounds that permanently impregnate cotton fabrics with disinfectant properties (U.S. Patent Office 1962). The process uses sodium hydroxide and various metallic salts in room-temperature reactions, with water as the solvent.

This manufacturing operation apparently provides no potential for production of dioxins by the known process of dioxin formation. In the manufacture of crude bithionol, there is no opportunity to reject any dioxins that may be present in the 2,4-dichlorophenol raw material. They would be carried through into the final product.

If bithionol is purified by the process outlined above, one filtration operation would remove compounds that are insoluble in hot chlorobenzene. Some dioxins, however, are slightly soluble in this solvent and thus might persist even in purified bithionol or its salts.

Sesin—

Sesin is an ester based on 2,4-dichlorophenol. The manufacture is similar to that of erbon, a 2,4,5-TCP-based herbicide described earlier. Although details of the first process step have not been reported, general organic chemical references indicate that sesin manufacture probably begins by a reaction between 2,4-dichlorophenol and ethylene chlorohydrin, as shown in the reaction sequence that follows (March 1968). Water is the most likely solvent, made strongly alkaline with sodium hydroxide, and the intermediate probably precipitates on addition of acid and is filtered from solution and dried



2,4-DICHLOROPHENOL

SESIN

A process patent discloses that the second reaction step is a combination of the intermediate with benzoic acid (U.S. Patent Office 1956d). Xylene is the solvent, and a small amount of sulfuric acid is used to remove the water formed in the reaction.

The resulting reaction mixture is neutralized with sodium carbonate and is then fractionally distilled under vacuum to recover the xylene for recycle and possibly to separate the product from any impurities.

The first step of the reaction is the one that could possibly form dioxins. Both the raw material and the resulting intermediate contain a chlorine atom ortho to a ring-connected oxygen atom, and the mixture is heated with sodium hydroxide. High temperature is not present, however. Since water is probably the solvent, this simple reaction would not ordinarily require application of pressure. Dioxin formation could occur at the surface of steam coils if high-pressure steam is used for distillation

Apparently no operation other than the final distillation would remove any dioxin contamination from this material Even this distillation may not isolate dioxins into a waste stream. Most dioxins either formed by the process or present in the raw material would probably be collected with the final product

Triclofenol Piperazine—

A pharmaceutical compound can be made from commercial 2,4,5-trichlorophenol for use as an anthelmintic (deworming medication) (U.S. Patent Office 1961a; Short and Elslager 1962). The research and animal tests of this drug were conducted prior to 1962 with unpurified commercial-grade 2,4,5-TCP. The drug was made by dissolving the chlorophenol in warm benzene and adding a measured quantity of piperazine. The resulting solution was filtered to remove insoluble matter, diluted with petroleum ether, and chilled. Crystals of the drug precipitated and were filtered from the mixture, washed with petroleum ether, dried, and packaged in gelatin capsules.

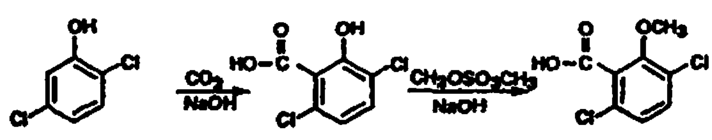
If this drug is being manufactured, the volumes are very low because it is not listed in most pharmaceutical trade references. Manufacture would probably be by the same process used in the laboratory, probably in very small batches, and with equipment not much larger than standard laboratory apparatus.

Any dioxins present in the TCP raw material are probably discharged in plant wastes rather than being concentrated into the pharmaceutical. Most of the dioxin probably is filtered from the benzene solution as part of the insoluble matter. Since some dioxins are slightly soluble in both benzene and petroleum ether, a portion might remain in solution and be transferred to solvent recovery distillation columns. The remaining dioxin would be discarded as part of an anhydrous tar from the base of these columns. The pharmaceutical industry usually incinerates both solid organic residues and solvent recovery tars.

Dicamba—

The herbicide dicamba is a derivative of salicylic acid known chemically as 3,6-dichloro-2-methoxybenzoic acid. In 1972, analysis of eight samples indicated no tetra-, hexa-, or hepta-CDD's at a detection level of 0.5 ppm (Woolson, Thomas, and Ensor 1972). The presence of DCDD's is theoretically possible, however (see Figure 23, p. 70).

Dicamba is made by acylation of 3,6-dichlorosalicylic acid, which in turn is made from 2,5-dichlorophenol. The chemical reactions are shown below.



2,5-DICHLOROPHENOL DICAMBA

The first step is known as the Kolbe-Schmitt reaction and is also used to make unsubstituted salicylic acid from unsubstituted phenol in addition to halogenated derivatives (U.S. Patent Office 1955a). Operating temperature is probably below 200° C, and operating pressure is probably greater than 8 atmospheres. The chlorinated salicylic acid is mixed into water and sodium hydroxide and treated with dimethyl sulfate (U.S. Patent Office 1967a). The reaction is conducted initially with refrigeration to retard the otherwise violent reaction; the mixture is then heated for a few hours at reflux temperature (slightly above 100° C).

On completion of the reaction, the mixture is acidified with hydrochloric acid. Dicamba precipitates and is filtered from the mixture, rinsed with water, and dried. Recrystallization from an organic solvent such as ether is possible, but probably is not conducted in commercial practice.

Except for high temperature, all conditions necessary for formation of chlorinated dioxins are present. It is likely that at high temperature dicamba would lose carbon dioxide in a reversal of the initial manufacturing reaction, and any dioxins formed would not contain carboxyl groups.

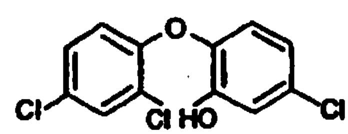
Dicamba is reported to be made by Velsicol Chemical Corporation in Beaumont, Texas, under the trade name Banvel (Stanford Research Institute 1978). It is commercially available in many formulated pesticide products

Other Chlorophenol Derivatives—

Compounds other than the products listed above are also potential dioxin sources, but are made and used in smaller volumes.

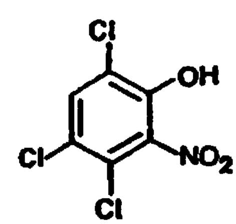
A compound with the trade name of Irgasan B5200 is used as a bacteriostat and a preservative. Often described by the generic abbreviation TCS, it is an acid amide derivative of a chlorinated salicylic acid, made by first reacting 2,4-dichlorophenol with sodium hydroxide and carbon dioxide at high pressure, then reacting the resulting intermediate with 3,4-dichloroaniline (U.S. Patent Office 1955a).

The germicide Irgasan DP-300 is a predioxin that was once sold in this country by Ciba-Geigy Corporation. As outlined in Section 2, it was used in some of the research of chlorinated dioxin chemistry, and dioxins were formed readily on heating of this compound. Its chemical formula is as follows:



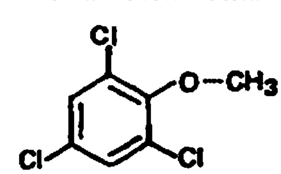
This compound is a derivative of 2,4-dichlorophenol, although the process of manufacture has not been reported.

The formulation called Dowlap was once used in the Great Lakes to control the sea lamprey, an eel-like fish. The active ingredient of the formulation was 3,4,6-trichloro-2-nitrophenol, whose chemical formula is as follows:



This compound was made by direct nitration of 2,4,5-trichlorophenol using concentrated nitric acid in a solvent of glacial acetic acid (Merck Index 1978).

A dye assistant chemical for use with polyester fibers was once made with the trade name Tyrene (Merck Index 1978) Its chemical name is 2,4,6-trichloroanisole or 2,4,6-trichloromethoxybenzene, with a structural formula as follows



It was probably made by acylation of 2,4,6-trichlorophenol with dimethyl sulfate

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
TRENTON, NEW JERSEY 08625

John W. Gaston
Director

February 16, 1983

Mr. William Turetsky
Director of Safety
Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Re: Givaudan Supply Wells

Dear Mr. Turetsky:

Attached is the well logs for Givaudan Well No's. 6 and 7. There is no information available from DWR's Water Allocation records with regards to the other five (5) wells at the site.

If you have any questions, you may contact me at (201) 648-2200.

Very truly yours,

Armando A. Arcenal
Principal Environmental Engineer
Region I
Enforcement Element

E122: G19

Attachment

FEB 17 1983

Well #6

Well flows naturally ______ gallons per minute, at ______ ft. above surface

Well pumps 25 gallons per minute with 206'4" of 3¼" pipe Elevation ______

Water rises to within 42'6" ft. of the surface Diameter 9"

Water is lowered to ______ ft. in ______ hours

8" pipe driven to rock, 127 feet, 9 in rock to 130'9"

Quality of water ______ Total depth 350 feet

Number of samples on file ______ Date Dr. Mar 19 – May 14, 1928

Remarks: Starts in Qsd

Log on back Pumps from Rb

Bottom in Rb

Well #7

Form G98-5c-2-25. 26·13·1

Location Delawanna (below Passaic) No. Co. well Haz

Owner Givaudan-Delawanna, Inc. Driller Wm Stothoff & Son

Well flows naturally ______ gallons per minute, at ______ ft. above surface

Well pumps 50 gallons per minute with 207 ft. 7" pipe. Elevation ______

Water rises to within 40'5" ft. of the surface Diameter 8"

Water is lowered to ______ ft. in ______ hours

Quality of water ______ Total depth 302'6"

Number of samples on file ______ Date Drilled May 17 – July 30, 1928

Remarks: Starts in Stratified drift

See back of card Pumps from Triassic ss

Bottom in Triassic ss

Log of well #6:

Sand, gravel & clay	0 - 28 ft.
" and gravel	28 - 32
Boulder stone	32 - 37
Sand, gravel & more clay	37 - 54
Black sand with clay	54 - 73
Fine sand with clay (water)	73 - 84
" " & a little clay	84 - 95
Mostly clay with fine sand (tried to develop well at depth of 95 feet. Result, almost no water.)	95 - 107
Clay and sand	107 - 113
Fine sand with clay and rock mixed	113 - 127
Red sandstone	127 - 350

Log of well #7:

Sand, clay and boulders	0-87 feet
" } Tested for water at 87-99 feet. Small	{87-99
" } flow	{99-114'6"
Red sandstone	114'6"-282
Gray "	282 - 293
Red "	293 - 302

8" hole continued to depth of 254 feet.

GIVANDON - DELAWANNA, INC.

Note: FOUND IN NJDEP Files

26·B·1

DELAWANNA - PASSAIC Co.

GIVAUDAN - DELAWANNA, INC. MFG. of AROMATIC CHEMICALS.

Acc'dy to A.F. RINORAND, There are 5 wells at this plant. All are now abandoned because of Pollution by aromatic chemical waste.

The waste is dumped into pits adjacent to the plant.

A.H.
6-15-49

F. S. Eichel
August 20, 1976

Copies: N. Greif
J. Dorsky

TRICHLOROPHENOL

(Report on Visit by EPA Officers Aug. 20, 1976)

From EPA (Edison, N. J. Office)

Mr. Rod Turpin, Consumer Safety Officer
Tel: 201/548-3347, Ext. 514

Dr. Art Gevirtz, Hazardous Material Spill Response Officer
Tel: 201/548-3347, Ext. 562

U.S. E.P.A.
Emergency Response Section
Edison N.J. 08817 wants TCDD analysis

Purpose of Visit

As a result of the accident at Icmesa, Washington ordered the N. J. EPA Office to check our records on recent TCP shipments from Icmesa and to obtain samples for TCDD assay. EPA wants to make sure hazardous amounts of TCDD are not in these shipments, the thought being that Icmesa could have been having process troubles before the accident.

They also wanted to know if any TCDD could be produced when we process TCP.

Results of Visit

(1) Dr. Gevirtz inquired if our processing of TCP was done in an alkaline medium. Answer was no, and in fact processing is done in acidic medium. Also assured him no TCDD was formed. He appeared satisfied.

(2) Mr. Von Essen provided copies of U.S. Customs Form 7501 covering last three TCP shipments that were imported from Icmesa.

54 dr, 26905 lb., arriving 5/14/76, lot 5980-76
47 dr, 23417 lb., arriving 5/26/76, lot 6750-76
34 dr, 16940 lb., arriving 7/25/76, lot 9260-76

These shipments were exported prior to the accident in Italy. None has been exported since then.

(3) Mr. Levy made up 2 oz. samples of the three lots from material on hand in the Quality Control Laboratory and gave them to the EPA officers. Duplicate samples were retained and will be assayed for TCDD by an independent laboratory.

W YORK, N.Y. 10005

8-5-76
TRX-8

CONSUMPTION ENTRY
UNITED STATES CUSTOMS SERVICE

RECORD COPY
CASHIER'S COPY

This Space For Census Use Only		REF. #	This Space For Customs Use Only	
BLOCK AND FILE NO.	M.O.T. / MANIFEST NO.	Form approved. Budget Bureau No. 48-217.6.	ENTRY NO. AND DATE: J66322	
FOREIGN PORT OF LADING	U.S. PORT OF UNLADING	Dist. and Port Code: 10-01	Port of Entry Name: NEW YORK	Term Bond No.: TB 1-5-77

Importer of Record (Name and Address): GIVAUDAN CORP. 100 Delawanna Ave. Clifton, NJ 07014

For Account of (Name and Address): SAME SAME

Importing Vessel (Name) or Carrier	B/L or AWB No.	Port of Lading	I.T. No. and Date
NEW ENGLAND TRAPPER (LIBERIA)	NY 203-2	Milan	
Country of Exportation	**Date of Exportation**	**Type and Date of Invoice**	**I.T. From (Port)**
Italy	6-30-76	CF 5515 7-20-76	
U.S. Port of Unlading	**Date of Importation**	**Location of Goods—G.O. No.**	**I.T. Carrier (Delivering)**
NEW YORK	7-25-76	ID C31535 7-30-76	

MARKS & NUMBERS OF PACKAGES COUNTRY OF ORIGIN OF MERCHANDISE (1)	DESCRIPTION OF MERCHANDISE IN TERMS OF T.S.U.S. ANNO., NUMBER AND KIND OF PACKAGES (2) — GROSS WEIGHT IN POUNDS (2a)	NET QUANTITY IN T.S. U.S. ANNO. UNITS (2b)	ENTERED VALUE IN U.S. DOLLARS (3)	T.S.U.S. ANNO. REPORTING NO. (4)	TARIFF OR I.R.C. RATE (5)	DUTY AND I.R. TAX (6) DOLLARS / CENTS
	H/H CONTAINER#.......... INTU 2475370			RELATED		
	THIRTY-FOUR DRUMS.......... TRICHLOR PHENOL					
	18503 lbs	16940 lbs	31594.	405.1500	12.5%	3949.25
			PEXT	31594.		
			CHGS	~~XXXX~~ 910.		
			EPEX	31594.	1.7¢lb	287.98
	DRUMS..................x		340.	640.3000	5%	17.00
			PEXT	340.		
			CHGS	~~XX~~ 50.		
	INV VAL: SwFcs 80682.00 @ .3958 $31934.00 as...$31934.00		EPEX	340.		
				TOTAL DUTY.........		4254.23
o. Italy	(34)			FEDERAL INSURANCE COMPANY 90 JOHN STREET, N.Y.C.		

MISSING DOCUMENTS	THIS SPACE FOR CUSTOMS USE ONLY

I declare that I am the ☐ nominal consignee and that the actual owner for customs purposes is as shown above, or ☐ consignee or agent of the consignee. I further declare that the merchandise ☐ was or ☐ was not obtained in pursuance of a purchase or agreement to purchase. I also include in my declaration all the statements in the declaration on the back of this entry.

[GIVAU]DAN CORP. 8-5-76 DATE
[10]0 Delawanna Ave. Clifton, NJ L. DURTO & FINK INC. (Signature)
[DA]VID L. QUIGLEY (Address)

☐ *Principal.*
☐ *Member of the firm.*
☐ ____________ *of the corporation.* (Title)
☐ *Authorized agent*

our order R-13360 (1st lot)
Havana Inv 17454

lot 9260-76

CUSTOMS FORM 7501

YORK, N.Y. 10005

CONSUMPT[illegible] ENTRY
UNITED STATES C[illegible]S SERVICE

TRX-8

RECORD COPY
CASHIER'S COPY

This Space For Census Use Only		REF. #	This Space For Customs Use Only
BLOCK AND FILE NO.	M.O.T. / MANIFEST NO.	Form approved. Budget Bureau No. 48-217.6.	ENTRY NO. AND DATE: 482178

[FO]REIGN PORT OF LADING	U.S. PORT OF UNLADING	Dist. and Port Code	Port of Entry Name	Term Bond No.
		10—01	NEW YORK	TB 1-5-77

Importer of Record (Name and Address): GIVAUDAN CORPORATION 100 Delawanna Ave Clifton N.J.

For Account of (Name and Address): Same Same

Importing Vessel (Name) or Carrier	B/L or AWB No.	Port of Lading	I.T. No. and Date
ELIZABETH BORNHOFEN (German)	203 NY 2 Milan	Antwerp/Milan	
Country of Exportation	**Date of Exportation**	**Type and Date of Invoice**	**I.T. From (Port)**
Belgium	5-5-76	CF 5515 5-7-76	
U.S. Port of Unlading	**Date of Importation**	**Location of Goods—G.O. No.**	**I.T. Carrier (Delivering)**
NEW YORK	5-14-76	ID C31228 5-17-76	

MARKS & NUMBERS OF PACKAGES COUNTRY OF ORIGIN OF MERCHANDISE (1)	DESCRIPTION OF MERCHANDISE IN TERMS OF T.S.U.S. ANNO., NUMBER AND KIND OF PACKAGES (2) — GROSS WEIGHT IN POUNDS (2a)	NET QUANTITY IN T.S. U.S. ANNO. UNITS (2b)	ENTERED VALUE IN U.S. DOLLARS (3)	T.S.U.S. ANNO. REPORTING NO. (4)	TARIFF OR I.R.C. RATE (5)	DUTY AND I.R. TAX (6) DOLLARS / CENTS
	H H... CONTAINER# ICSU 2764850			Related		
	Fifty-Four Drums.... TRICHLOR PENOL-2,4,5					
	29365 lbs	26905 lbs	37210.	405.1500	12.5%	4651.25
					1.7¢lb	457.39
				Pext 50719. Chgs 1836. Epex 37210.		
	Drums.... X		540.	640.3000	5%	27.00
				Pext 540. Chgs 20. Epex 540.		
	Inv. Value: SwFcs 128142.00					
	@.3958 $ 50718.60					
	Ded for val 13509.07					
	37209.53			TOTAL DUTY....		5135.64
	Add val 540.00					
	37749.53					
Italy	as.$ 37750.00			FEDERAL INSURANCE COMPANY 90 JOHN STREET, N.Y.C.		
	(54)					

MISSING DOCUMENTS	THIS SPACE FOR CUSTOMS USE ONLY

I declare that I am the ☐ nominal consignee and that the actual owner for customs purposes is as shown above, or ☐ consignee or agent of the consignee. I further declare that the merchandise ☐ was or ☐ was not obtained in pursuance of a purchase or agreement to purchase. I also include in my declaration all the statements in the declaration on the back of this entry.

GIVAUDAN CORPORATION 6-1-76 DATE

100 Delawanna Ave Clifton NJ LOCusto&Funk, Inc

David L. Quigley (Address)

☐ *Principal.*
☐ *Member of the firm.*
☐ *Authorized agent*

of the corporation. (Title)

our Order R-858 (4th lot)
Rec. Inv. - 13418

lot 5980-76

CUSTOMS FORM 7501

#15

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08817

November 22, 1976

Mr. Frederick G. Eichel
Senior Vice President
Givaudan Corporation
100 Delawanna Avenue
Clifton, New Jersey 07014

Dear Mr. Eichel:

Attached is a copy of a letter received by me from Dr. Upholt of our Washington office reporting results of TCDD analysis on samples supplied by you to Dr. Gevirtz of my staff. As you can see, the results of the analysis obtained by EPA agree with your analytical results.

Our analysis also indicated the possible existence of two other dioxins, the significance of which most probably will be undergoing evaluation.

I want to again thank you for your cooperation in this matter.

Sincerely yours,

Michael V. Polito
Emergency Response &
Inspection Branch

Attachment

cc: E. B. Outwater, DRA

Rec'd 11/29/76
✓ Copies: N. Greif
J. Dorsky
C. Snyder
S. Good
L. Leroy
K. Aspinall
Dr. Mancewitz CC all 1/21/77
R.J. Dunkey (2) 1/20/77

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER AND HAZARDOUS MATERIALS

MEMORANDUM

SUBJECT: Analysis of Givaudan Trichlorophenol

FROM : William M. Upholt, Ph.D., Director William M. Upholt
Health Effects and Science Policy, OWHM (WH-556)

TO Michael V. Polito
Chief, Emergency Response & Inspection Branch
Surveilliance and Analysis Division, EPA
Edison, New Jersey 08817

Enclosed are the results I have received from NIEHS and Wright State University on analysis of Trichlorophenol from Givaudan, which you sent to them at my request.

A summary of their results on 2,3,7,8-TCDD only follows:

Sample No.	Laboratory	TCDD Found	TCDD Reported by Givaudan
5980-76	Wright State	1.9 ppb	2.0 ppb
6750-76	NIEHS	0 at 2 ppb sensitivity	14.0 ppb
9260-76	Wright State	1.8 ppb	2.0 ppb

The results are quite consistent with those reported by Givaudan (shown in last column) and indicate a very low level of 2,3,7,8-Tetrachlorodibenzo-p-dioxin. In addition, NIEHS found 7.4 ppb of a compound believed to be 1,2,3,4,6,7,8-Heptachloro DD in sample No. 6750-76 and Wright State found 0.119 ppb of an Octachloro DD in sample No. 9260-76.

Enclosure

cc:
Eric Outwater, DRA
John Moore, NIEHS
T. O. Tiernan, Wright State Univ.
Tom Holloway (WH-566)
Phil Kearney, USDA, N.E. Reg.
Barry Commoner, Washington Univ.
Assistant to Deputy Adm. (A-101)
Dir., Operations Coordination

REPORT OF SAMPLE ANALYSIS

FROM: U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration
1560 E. Jefferson
Detroit, MI. 48207

REFERENCE TO THIS REPORT OF ANALYSIS IS PROHIBITED IN LABELING, ADVERTISING, OR OTHER SALES PROMOTION.

TO:

Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J. 07015

FDA SAMPLE NUMBER
83-336-421

DATE SAMPLE COLLECTED
06-27-83

COLLECTING INSPECTOR
Brenda L. Holmes

DESCRIPTION OF SAMPLE
Eight ounces of Hexachloraphene collected froma drum identified lot 15304.

ESTABLISHMENT WHERE SAMPLE COLLECTED *(If other than addressee)*

REASON FOR SUBMISSION OF REPORT

☒ SECTION 704*(d)* OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT
☐ OTHER —Cooperation with growers

REPORT OF ANALYSIS

The above sample was examined for the presence of ~~one or more pesticide and/or industrial chemical~~ residues.
Results of analysis were as follows: 2,3,7,8 TCDD (A Dioxin)

☐ No Residues found.

☒ Residue(s) found are not of regulatory significance.

☐ Residue(s) found may be of regulatory significance.
Specific details are provided below.

Found 16.1 ppt TCDD.
Compendial limit 50 ppb
USPXX, 3rd Suppl. p. 142.

DATE	SIGNATURE	TITLE
08-23-83	James E. Westfall	Supervisory Chemist

REPORT OF SAMPLE ANALYSIS

FROM: U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration
1560 E. Jefferson
Detroit, MI. 48207

REFERENCE TO THIS REPORT OF ANALYSIS IS PROHIBITED IN LABELING, ADVERTISING, OR OTHER SALES PROMOTION.

TO:

Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J. 07015

FDA SAMPLE NUMBER: 83-336-422

DATE SAMPLE COLLECTED: 06-27-83

COLLECTING INSPECTOR: Brenda L. Holmes

DESCRIPTION OF SAMPLE

Eight ounces of Hexachlorophene collected from a drum identified lot 15309.

ESTABLISHMENT WHERE SAMPLE COLLECTED *(If other than addressee)*

REASON FOR SUBMISSION OF REPORT

☒ SECTION 704*(d)* OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT

☐ OTHER ---Cooperation with growers

REPORT OF ANALYSIS

The above sample was examined for the presence of ~~one or more pesticide and/or industrial chemical~~ 2,3,7,8 - TCDD (dioxin) residues. Results of analysis were as follows:

☐ No Residues found.

☒ Residue(s) found are not of regulatory significance.

☐ Residue(s) found may be of regulatory significance. Specific details are provided below.

Found 16.6 ppt TCDD
Compendial limit 50 ppb
USPXX, 3rd Suppl. p. 142.

DATE: 08-23-83

SIGNATURE: James E. Westfall

TITLE: Supervisory Chemist

REPORT OF SAMPLE ANALYSIS

FROM: U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration
1560 E. Jefferson
Detroit, MI. 48207

REFERENCE TO THIS REPORT OF ANALYSIS IS PROHIBITED IN LABELING, ADVERTISING, OR OTHER SALES PROMOTION.

TO:

Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J. 07015

FDA SAMPLE NUMBER
83-336-423

DATE SAMPLE COLLECTED
06-27-83

COLLECTING INSPECTOR
Brenda L. Holmes

DESCRIPTION OF SAMPLE

Eight ounces of Hexachlorophene collected from a drum identified lot 15330.

ESTABLISHMENT WHERE SAMPLE COLLECTED *(If other than addressee)*

REASON FOR SUBMISSION OF REPORT

☒ SECTION 704(d) OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT
☐ OTHER —Cooperation with growers

REPORT OF ANALYSIS

The above sample was examined for the presence of ~~one or more pesticide and/or industrial chemical~~ 2,3,7,8 - TCDD (dioxin) residues. Results of analysis were as follows:

☐ No Residues found.

☒ Residue(s) found are not of regulatory significance.

☐ Residue(s) found may be of regulatory significance. Specific details are provided below.

Found 21.8 ppt TCDD
Compendial limit 50 ppb
USPXX, 3rd Suppl. p. 142.

DATE	SIGNATURE	TITLE
08-23-83	James E. Westfall	Supervisory Chemist

REPORT OF SAMPLE ANALYSIS

FROM: U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration
1560 E. Jefferson
Detroit, MI. 48207

REFERENCE TO THIS REPORT OF ANALYSIS IS PROHIBITED IN LABELING, ADVERTISING, OR OTHER SALES PROMOTION.

TO:

Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J. 07015

FDA SAMPLE NUMBER: 83-336-425

DATE SAMPLE COLLECTED: 06-27-83

COLLECTING INSPECTOR: Brenda L. Holmes

DESCRIPTION OF SAMPLE

Eight ounces of Hexachlorophene collected from a drum identified lot 15303.

ESTABLISHMENT WHERE SAMPLE COLLECTED *(If other than addressee)*

REASON FOR SUBMISSION OF REPORT

☒ SECTION 704*(d)* OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT

☐ OTHER —Cooperation with growers

REPORT OF ANALYSIS

The above sample was examined for the presence of ~~one or more pesticide and/or~~ industrial chemical residues. Results of analysis were as follows: 2,3,7,8 - TCDD (dioxin)

☐ No Residues found.

☒ Residue(s) found are not of regulatory significance.

☐ Residue(s) found may be of regulatory significance. Specific details are provided below.

Found 17.2 ppt TCDD
Compendial limit 50 ppb
USPXX, 3rd Suppl. p. 142.

DATE	SIGNATURE	TITLE
08-23-83	James E. Westfall	Supervisory Chemist

Dr. H.A. Brandman
Clifton, N.J.
February 22, 1977

Dr. Dorsky
Dr. Manowitz
Mr. Snyder
Dr. Brandman
~~Mr. Aspinwall~~
~~Mr. Scala~~
~~Mr. Blum~~
Mr. Broderick
Mr. von Essen
Mr. Levy
Mr. Greif
Mr. Porcaro
Mr. Gold
Dr. Vaterlaus
Dr. Sambeth
Circulation
Technical Committee
Forschungssekretariat
EDT
Prof. [illegible]
~~[illegible]~~
D. [illegible]

Specifications for 2,4,5-Trichlorophenol (Dow)

Meeting at Clifton

(Feb. 16, 1977)

Purpose: To review Dow's proposed specifications for 2,4,5-trichlorophenol (TCP)

For Dow: Joe Stearns: Product Sales Mgr.- Agricultural Products
Ed Neitzke: Account Mgr. - Agricultural Products

For Givaudan: Ken Aspinwall
Hal Brandman
Len Levy
George von Essen

Dow's representatives presented tentative specifications for their TCP that they feel are reasonably attainable. They regard the next two months as a trial period to evaluate their ability to meet these specs. The proposed specifications are as follows:

		Dow Proposed	Givaudan Requested
2,4,5-Trichlorophenol		99.0%	99.5%
2,4- and 2,5-Dichlorophenol	0.25		
3,4-Dichlorophenol	0.20		
Total Dichlorophenols		0.45	<0.2
2-Chloro-5-methoxyphenol		0.30	<0.1
2,3,6-Trichlorophenol		0.50	<0.3
TCDD		<0.01[1] ppm	<0.01 ppm
Color		–[2]	Givaudan 3
Iron		–[3]	<5 ppm

[1]It was requested of Dow that they furnish actual TCDD levels instead of "less than" figures. They are reluctant to do this citing the amount of time required for each analysis. When pressed on this matter Stearns suggested it be taken up with Bob Hudberg or Ed Freiter.

[2]Dow is currently evaluating Givaudan's procedure for TCP color analysis (Letter: L. Levy to R. Hudberg - 1/4/77).

[3]This has not yet been established.

In addition to the above, Neitzke was asked to check on the presence of dichloroanisoles or 2,3,5-trichlorophenol in Dow's TCP.

HB

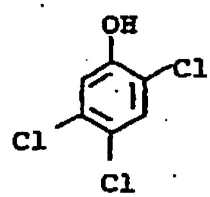
:eg

GIVAUDAN CORPORATION

QUALITY CONTROL DEPARTMENT

SPECIFICATIONS

2,4,5-TRICHLOROPHENOL



Molecular Formula: $C_6H_3Cl_3O$

Molecular Weight: 197.46

APPEARANCE & COLOR: White to off-white fused mass or flake. Molten material may have a slight pink cast.

COLOR OF TCP IN SOLUTION: A 10% alcoholic solution is prepared. The color of this solution is no darker than Givaudan Color 3 (.00050 g. Potassium Dichromate/100 ml. 2% Sulfuric Acid).

CONGEALING POINT: 63.5°C. Minimum

Givaudan Index Test Method V.

PURITY & IMPURITES BY GAS CHROMATOGRAPHIC ANALYSIS:

2,4,5-Trichlorophenol	98.7% Minimum
2,3,6-Trichlorophenol	0.5% Maximum
Dichlorophenols	0.5% Maximum
2-Chloro-5-Methoxyphenol	0.3% Maximum
Dichloromethoxy Phenol	0.5% Maximum

Procedure: GLC analysis using normalized area for the determination.

Equipment:

1. GLC unit equipped with a flame ionization, detector and electronic integrator.
2. Column: 6' x 1/8", 4% FFAP on 100/120 chromosorb G.
3. Chromatographic Conditions
   A. Flow: 40 ml/min.
   B. Sample Size: 0.2 ul of a solution of sample in acetone.
   C. Sensitivity: 2×10^2
   D. Oven Temperature: 190°C.

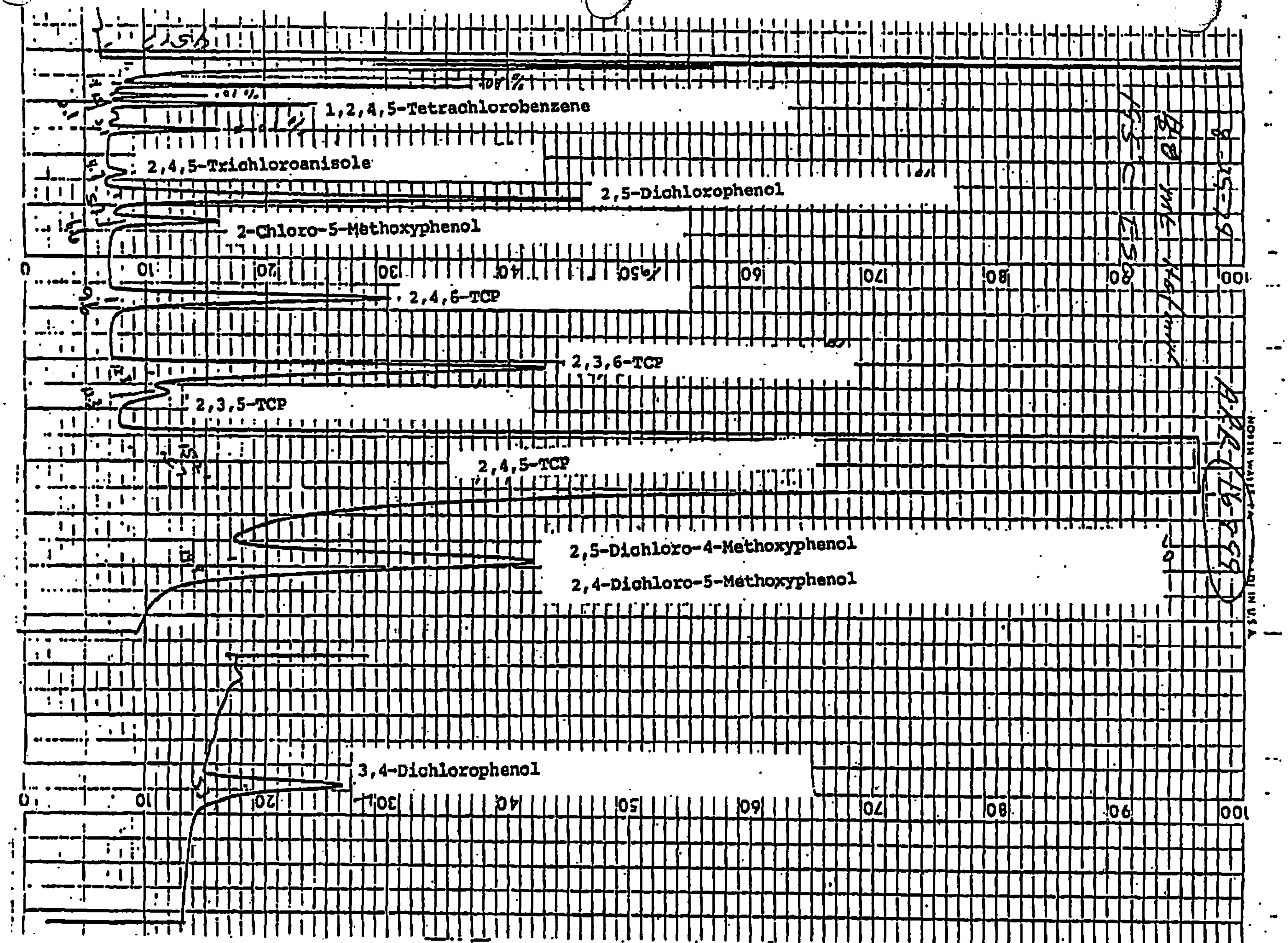
Note: Identities and purities are determined based on the attached curve.

SPECIAL REQUIREMENTS:

* 2,3,7,8-Tetrahylorodibenzo-1-dioxin (TCDD): 1 ppb Maximum

*Certification for TCDD content is to be furnished by the supplier for each batch of TCP.

December 1, 1983


1,2,4,5-Tetrachlorobenzene
2,4,5-Trichloroanisole
2,5-Dichlorophenol
2-Chloro-5-Methoxyphenol
2,4,6-TCP
2,3,6-TCP
2,3,5-TCP
2,4,5-TCP
2,5-Dichloro-4-Methoxyphenol
2,4-Dichloro-5-Methoxyphenol
3,4-Dichlorophenol
0
10
20
30
40
50
60
70
80
90
100

AGRICULTURAL PRODUCTS DEPARTMENT

technical data sheet

PRODUCT STEWARDSHIP GUIDELINES FOR SAFE HANDLING OF 2,4,5-TRICHLOROPHENOL

PURIFIED

INGREDIENTS (Specifications)

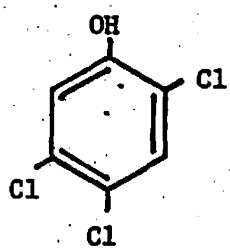
2,4,5-Trichlorophenol, minimum 98.0%

Other related chlorophenols, maximum 2.0%

2,3,7,8-Tetrachlorodibenzo-p-dioxin, maximum 0.01 ppm

PHYSICAL PROPERTIES (These are laboratory or literature data typical of the product and are not to be considered as, or confused with, specifications.)

STRUCTURE



Formula	$C_6H_2Cl_3OH$
Molecular Weight	197.5
Freezing Point, °C	65
Boiling Point, °C	253
Flash Point	>860°F C.O.C.
Specific Gravity (Technical)	1.5 @ 167°F
Solubility in water @ 25°C (gm/100 gm)	0.119
Acetone	610
Benzene	83.5
Methanol	610
Toluene	120

DOW CHEMICAL U.S.A.
AGRICULTURAL PRODUCTS DEPARTMENT • MIDLAND, MICHIGAN 48640

DOW*

HEALTH HAZARDS, TOXICOLOGICAL PROPERTIES & FIRST AID

Introduction

The following statements on health hazards and toxicological findings summarize some of our laboratory findings for 2,4,5-trichlorophenol (TCP). Further information concerning these matters may be obtained by contacting the Agricultural Products Department of The Dow Chemical Company.

Toxicological Properties of 2,4,5-Trichlorophenol

1. Ingestion

TCP is low in acute oral toxicity. The LD_{50} for rats is in the range of 2400-2850 mg/kg of body weight. The chronic oral toxicity is as follows:

A. Rabbits — Twenty oral doses of TCP in 28 days produced no changes at levels of 0.001 and 0.01 g/kg. Slight kidney changes were detected at 0.1 g/kg and very slight kidney and liver changes at the 0.5 g/kg level.

B. Rats — Doses of 0.03, 0.1, 0.3 and 1.0 g of TCD/kg in olive oil were administered via stomach tube 5 times a week for 4 weeks. No significant changes were detected except a depression of growth and an increase in erythrocyte fragility at the 1.0 g/kg dosage level.

C. Rats — TCP was fed in food at 100, 300, 1000, 3000 and 10,000 ppm for 98 days. No adverse effects were detected at 1000 ppm or less; 3000 and 10,000 ppm caused mild diuresis and slight changes in kidney and liver.

2. Eye Contact

TCP is capable of causing severe irritation, even marked corneal injury.

3. Skin Contact

A single short skin exposure to TCP may cause redness and swelling of the skin. Repeated minimal exposure without washing may cause skin irritation. TCP is capable of causing more severe chemical burns upon prolonged exposure and when contact is made with melted material. Experience has indicated that this material is not absorbed through the skin in acutely toxic amounts.

4. Inhalation

TCP dusts may be irritating to the nose and throat.

Toxicological Properties of TCDD

The very highly toxic chemical, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) can be formed in hazardous amounts under certain chemical and process conditions. TCDD has been demonstrated to cause tumors in a lifetime rat feeding study at 0.1 μg/kg of body weight/day, but not at levels of 0.01 or 0.001 μg/kg of body weight/day. It has also demonstrated to cause birth defects when given to mice subcutaneously at 1-3 μg/kg/day for ten days during the second trimester of gestation (no effect level was observed at less than 1 μg/kg/day). In humans sufficient exposure to TCDD may cause chloracne, a dermatologic condition which results in multiple comedo ("blackhead") formations primarily on the face although other parts of the body may be involved. Appearance of chloracne may indicate exposure to dangerous levels of TCDD.

First Aid Measures For TCP

Eye Contact -- Contaminated eye(s) should be flushed promptly and thoroughly with copious amounts of flowing water for at least 15 minutes. Get medical attention.

Skin Contact -- Contaminated skin should be washed with soap and plenty of water. Any irritation that develops should receive medical attention.

Inhalation -- Anyone experiencing any noticable ill effect from breathing the dusts of the product should be removed to fresh air. Medical attention should be obtained.

PROCESSING HAZARDS & PRECAUTIONS

Introduction

Precautions for safe handling and use are necessarily general in nature, since the circumstances associated with each customer's use of the material are unknown and beyond our control. Suggestions with regard to the hazards likely to be encountered in specific operations will be made upon request whenever possible. Inquiries about such specific operations and uses may be directed to the Agricultural Products Department of The Dow Chemical Company.

Factors Influencing TCDD Formation

Two of the factors influencing the formation of TCDD from TCP are temperature and time. Retention of TCP at 150°C for several days has resulted in formation of TCDD. As the temperature and/or time are increased, the TCDD can reach levels of several ppm in TCP. Formation of TCDD in TCP has been catalyzed by contact with iron at 150°C. TCDD may also be formed at lower temperatures or shorter periods of time.

The most likely conditions for formation of TCDD to occur requires that the TCP be in an alkaline condition. Heating an alkaline solution of TCP at temperatures of 60°C for thirty hours or 100°C for four hours at pH = 11 will result in the formation of measurable amounts of TCDD.

Precautions for Safe Handling & Storage

During periods of long storage of molten TCP temperatures in excess of 80°C should be avoided. Processing temperatures of TCP in excess of 150°C should be avoided. It is preferrable to process TCP at temperatures below 100°C to minimize the potential for TCDD formation. If necessary to process TCP at temperatures over 100°C, frequent monitoring of the TCDD formation should be employed.

Process operations where TCP is handled in an alkaline condition should not be conducted at temperatures over 100°C wihtout prior consultation with Dow technical personnel. When processing under alkaline conditions, frequent monitoring of TCDD formation should be employed. The user should thoroughly monitor his process and eliminate all points of high localized temperatures. Sources of energy input which can cause process temperature in the alkaline condition to rise above 100°C should be identified and evaluated.

Equipment Handling

Great caution should be observed any time a residue or a decomposition product of TCP is encountered. This material should be considered to contain TCDD until laboratory analysis has established the absence of TCDD.

Any residues should be collected and disposed of via proper methods. Contaminated equipment should be retained in the work area until properly cleaned.

All high temperature treatments such as torch cutting, burning or direct firing of equipment that is in contact with TCP can be extremely dangerous since TCDD formation is likely to occur under these conditions. A thorough cleaning should precede these heat treatments. After cleaning, precautions should be taken to insure the isolation of the worker from contact with any vapors.

PERSONNEL SAFETY & PRECAUTIONS

Precautions For Safe Handling

Chemical workers' goggles or their equivalent should be worn when TCP is handled.

When operations such as loading, sampling, measuring cleaning up spills are carried out or in other instances when skin contact is likely to occur, the operator should wear a face shield, monogoggles and impervious rubber suit (or equivalent). After use, the above clothing should be thoroughly laundered before re-use.

Exposure of persons to a dusty atmosphere or vapors containing TCP requires the use of an organic vapor respirator equipped with a dust filter.

Personal Hygiene & Wipe Testing

Trichlorophenol should be contained within the operating areas at all times. A personal hygiene program which includes the proper use of decontamination procedures should be instituted in any plant that has the potential for employee exposure to TCDD.

1. Employees working in the area should be well informed and acquainted with the toxicity and potential hazards associated with TCDD.

2. All operators working in the production area should shower thoroughly each day before leaving the plant.

3. Work clothes should be kept on site, changed daily and washed separately, preferably at a separate laundry facility located at the plant site.

4. Food, beverages and smoking should be restricted to designated areas free of chemical contamination.

A regimen of wipe tests of work areas and subsequent analysis for TCDD should be established to assure that personal exposure is minimized. Wipe testing is intended to be used as an indirect measure of the skin contact hazard from chemical exposure to which operating personnel may be subjected. If wipe tests are carried out on a well chosen set of sample locations, the collective results can provide an indication of general plant cleanliness and may point out specific areas of contamination if they occur. Wipe testing methodology will be supplied by the Agricultural Products Department of The Dow Chemical Company on request.

DOW CHEMICAL U.S.A.

February 6, 1980

MICHIGAN DIVISION
MIDLAND, MICHIGAN 48640

FEB. 11, 1980
COPIES: J. BRODERICK
L. LEVY — WILL THIS MAKE HEX. NON-USP?
M. MANOWITZ
P. GROSS
L. BLECKER

Mr Robert Aron
Givaudan Corp.
100 Delawana Ave.
Clifton, New Jersey 07014

RE: 2, 4, 5 TRICHLOROPHENOL TECHNICAL GRADE

Dear Sir:

Inspection of the remaining drums of 2, 4, 5 Trichlorophenol technical grade (TCP), indicates that lot identity can be assigned to only 8 drums. These drums have received minor damage and some superficial rusting has occurred. Nevertheless, the integrity of the drums appears to have been maintained. The TCP is part of lot number MM06139, and has the following analysis:

COMPONENT	% BY WEIGHT
3, 4 Dichlorophenol	0.04
2, 4; 2, 5; 2, 6 Dichlorophenols	0.17
2, 3, 6 Trichlorophenol	0.28
2, 4, 5 Trichlorophenol	95.12
Monochloromethyoxyphenol	N.D.
Dichloromethyoxyphenol	4.17
Trichloroanisole	0.01
Tetrachlorophenol	N.D.
2, 3, 7, 8 Tetrachlorodibenzo-p-dioxin	<0.01 ppm

If I can be of further assistance please do not hesitate to call.

Regards,

John R. Ulrich, Supt.
Trichlorophenol Plant
Dow Chemical Company
Midland, Michigan 48640

(517) 636-3219

cc: Dave Cheek - Dow Chemical Co., New York Sales Office

AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

CERTIFICATE OF ANALYSIS — THE DOW CHEMICAL COMPANY

DESCRIPTION OF MATERIAL: 2,4,5-Trichlorophenol, Technical

DATE: 12-27-78

DOW ORDER NO.: 4645599

AMOUNT: 6 drums

CAR OR TRUCK NO.:

LOT NUMBERS:

CUSTOMER ORDER NO.: R21661

CONTRACT NO.:

CUSTOMER NAME AND ADDRESS:
Givaudan Corporation
Attention: Mr. G.T. VonEssen, Purchasing Dept.
100 Delawanna Avenue
Clifton, NJ 07014

DATE SHIPPED: 12-27-78

DOW LAB FILE NO.:

I CERTIFY: That the material shipped has the following analysis:

	Lot Number MM07248
2,4,5-Trichlorophenol	94.8%
2,3,6-Trichlorophenol	0.3%
Dichlorophenols	0.1%
Dichloromethoxyphenol	4.7%
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	<0.01 ppm

THE DOW CHEMICAL COMPANY

BY C. M. Olson
C. M. Olson, Quality Assurance

2,4,5-TRICHLOROPHENOL

SPECIFICATIONS

Compositions by GC Analyses:

2,4,5-TCP	98.3% minimum
2,3,6- and other TCPs	0.5% maximum
Dichlorophenols	0.5% maximum
Monochloromethyoxyphenols	0.2% maximum
Dichloromethoxyphenols	0.5% maximum
TCDD (Dioxin)	$<$1.0 ppb

October 23, 1978

Gold, Wallis, Dorsky

CERTIFICATE OF ANALYSIS

DOW — THE DOW CHEMICAL COMPANY

DESCRIPTION OF MATERIAL: 2,4,5-Trichlorophenol, Technical — 6 Drums	DATE: 9-25-78
DOW ORDER NO.: 0050196 — AMOUNT:	CAR OR TRUCK NO.:
LOT NUMBERS: MM06298	CUSTOMER ORDER NO.:
CUSTOMER NAME AND ADDRESS: Givaudan Corp. 100 Delawanna Ave. Clifton, NJ 07014 Attn: Mr. G.T. VonEssen, Purchasing Dept.	CONTRACT NO.:
SEP 28 1978 PURCHASING DEPARTMENT	DATE SHIPPED: 9-22-78
	DOW LAB FILE NO.:

I CERTIFY:

that the material shipped has the following analysis:

	Lot Number MM06298
2,4,5 Trichlorophenol	94.4%
2,3,6 Trichlorophenol	0.4%
Dichlorophenols	0.3%
Dichloromethoxyphenol	4.9%
2,3,7,8 Tetrachlorodibenzo-p-Dioxin	<0.01 ppm

THE DOW CHEMICAL COMPANY

BY Allen J. Howard

Allen J. Howard, Quality Assurance

STOCK FORM 7050 PRINTED R-11-70

CERTIFICATE OF ANALYSIS

THE DOW CHEMICAL COMPANY

DESCRIPTION OF MATERIAL 2,4,5-Trichlorophenol, Technical	DATE 12-27-78
DOW ORDER NO. 4645599 — AMOUNT 6 drums	CAR OR TRUCK NO.
LOT NUMBERS	CUSTOMER ORDER NO. R21661
	CONTRACT NO.
CUSTOMER NAME AND ADDRESS Givaudan Corporation Attention: Mr. G.T. VonEssen, Purchasing Dept. 100 Delawanna Avenue Clifton, NJ 07014	DATE SHIPPED 12-27-78
	DOW LAB FILE NO.

I CERTIFY: That the material shipped has the following analysis:

	Lot Number MM07248
2,4,5-Trichlorophenol	94.8%
2,3,6-Trichlorophenol	0.3%
Dichlorophenols	0.1%
Dichloromethoxyphenol	4.7%
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	<0.01 ppm

RECEIVED at RESEARCH

JAN - 4 1979

THE DOW CHEMICAL COMPANY

BY C. M. Olson

C. M. Olson, Quality Assurance

STOCK FORM 7050 PRINTED R-11-70

Mr. S. Gold
Dr. J. Dorsky✓
Dr. R. Genet
Mr. N. Panagiotakis
Mr. O. Piplani
Ms. P. Shepard

PURCHASE ORDER CHANGE

DATE: September 29, 1978

Please change your copy of Order No. R 21001, Trichlorophenol to
read as follows: Technical Grade "Dow" Code No. 2-75

Quantity: ______

Price: $2.50 lb. FOB Midland, Michigan

Delivery: ______

Shipping Terms: ______

Others: Complete Schedule:
Bulk Tanktruck/Tankcar - $2.40 lb.
Truckload Drums - 2.46 lb. (40,000 lbs.)
Less than truckload - 2.50 lb.
ALL FOB Midland, MI.

George T. Von Essen
Purchasing Dept. - Raw Materials

Copies Jerry, Bernard

CERTIFICATE OF ANALYSIS

DOW THE DOW CHEMICAL COMPA

DESCRIPTION OF MATERIAL
2,4,5-Trichlorophenol, Technical 6 Drums

DATE
9-25-78

DOW ORDER NO.
0050196

AMOUNT

CAR OR TRUCK NO.

LOT NUMBERS
MM06298

CUSTOMER ORDER NO.

CONTRACT NO.

CUSTOMER NAME AND ADDRESS
Givaudan Corp.
100 Delawanna Ave.
Clifton, NJ 07014
Attn: Mr. G.T. VonEssen, Purchasing Dept.

SEP 28 1978
PURCHASING DEPARTMENT

DATE SHIPPED
9-22-78

DOW LAB FILE NO.

I CERTIFY:

that the material shipped has the following analysis:

	Lot Number MM06298
2,4,5 Trichlorophenol	94.4%
2,3,6 Trichlorophenol	0.4%
Dichlorophenols	0.3%
Dichloromethoxyphenol	4.9%
2,3,7,8 Tetrachlorodibenzo-p-Dioxin	<0.01 ppm

THE DOW CHEMICAL COMPANY

BY Allen J. Howard
Allen J. Howard, Quality Assurance

STOCK FORM 7050 PRINTED R-11-70

CERTIFICATE OF ANALYSIS — DOW — THE DOW CHEMICAL COMPAN

DESCRIPTION OF MATERIAL: 2,4,5-Trichlorophenol (Purified)	DATE: March 17, 1978
DOW ORDER NO.: 3459156 — AMOUNT:	CAR OR TRUCK NO.:
LOT NUMBERS: See below	CUSTOMER ORDER NO.:
CUSTOMER NAME AND ADDRESS: Givaudan Corporation 125 Delawanna Avenue Clifton, N. J. 07014 ATTN: Mr. G. VonEssen, Purchasing Dept.	CONTRACT NO.: DATE SHIPPED: March 16, 1978 DOW LAB FILE NO.:

I CERTIFY: that the material shipped has the following analyses:

	LOT NUMBERS MM 08087	MM 06137
2,4,5-Trichlorophenol, %	99.1	98.4
2,3,6-Trichlorophenol, %	0.3	.4
Dichlorophenols, %	0.3	0.2
Monochloromethoxyphenol, %	0.2	0.4
2,3,7,8-Tetrachlorodibenzo-para-dioxin (ppm)	<0.01	<0.01

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MAR 31 1978

cc. Gold Dorsky Braden, Marrinozz

THE DOW CHEMICAL COMPANY

BY Allen J. Howard /co

Allen J. Howard, Quality Assurance

STOCK FORM 7050 PRINTED R-11-70

zpres - Dr. Bowley
Am Trolek
mr Levy

CERTIFICATE OF ANALYSIS

THE DOW CHEMICAL COMP

DESCRIPTION OF MATERIAL: 2,4,5-Trichlorophenol (Purified)

DATE: 5-18-78

DOW ORDER NO.: 4245680

AMOUNT:

CAR OR TRUCK NO.:

LOT NUMBERS: See Below.

CUSTOMER ORDER NO:

CONTRACT NO.:

CUSTOMER NAME AND ADDRESS:
Givaudan Corp.
100 Delawanna Ave.
Clifton, NJ 07014
Attn: G. Von Essen

DATE SHIPPED: 5-17-78

DOW LAB FILE NO.:

I CERTIFY: that the material shipped has the following analysis:

	Lot Numbers					
	MM03318	MM03278	MM03288	MM04178	MM04148	MM04048
2,4,5 TCP ... %	98.9	98.6	98.6	98.6	98.7	98.8
2,3,6 TCP ... %	0.4	0.6	0.6	0.6	0.5	0.3
Dichlorophenols ... %	0.4	0.6	0.6	0.7	0.7	0.4
Monochloromethoxyphenol ... %	0.4	0.03	0.03	0.1	0.2	0.6
2,3,7,8 Tetrachlorodibenzo-p-dioxin (PPM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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MAY 31 1978
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JUN - 5 1978

THE DOW CHEMICAL COMPANY

BY Allen J Howard
Allen J. Howard - Quality Assurance

STOCK FORM 7050 PRINTED 8-11-70

W.W. Walck
8

GIVAUDAN CORPORATION
(FOR INTERNATIONAL CABLES & TELEX'S)

Page 1 of 1 pages. Operator's Use Only
Message number: ________
Date/Time sent: ________

Authority to transmit S. Gold Dept. Operations

TO: G G
Givaudan S. A.
Geneva, Switzerland

6/5/78

TEXT: Attn. J. Sambeth
Current Specs. Dow Tech. TCP taken from recent Certificates of Analysis are:

2,4,5 Trichlorophenol		94.0% Minimum
2,3,6 Trichlorophenol		0.5% Max.
Dichlorophenols		0.4% Max.
Dichloromethoxyphenol		5.0% Max.
Mono Chloromethoxyphenol	Less than	0.01%
2,3,7,8 Tetrachlorodibenzo-p-Dioxin	Less than	0.01 PPM

We have asked Dow for latest Tech. TCP Specs.

1979 Pure TCP requirement 273 tons, Celemerck contract calls for 120 tons leaving shortfall of 153 tons Pure TCP. One ton pure TCP is equivalent to 1.2 tons Tech. TCP therefore we require 183 tons Tech. TCP.

Regards, Gold

[illegible]

CERTIFICATE OF ANALYSIS

THE DOW CHEMICAL COMPAN

DESCRIPTION OF MATERIAL		DATE
2,4,5-Trichlorophenol (Purified)		5-18-78
DOW ORDER NO. 4245681	**AMOUNT**	**CAR OR TRUCK NO**
LOT NUMBERS See below		**CUSTOMER ORDER NO**
CUSTOMER NAME AND ADDRESS	Givaudan Corp. 100 Delawanna Ave. Clifton, New Jersey 07014 ATTN: G. VonEssen	**CONTRACT NO.** **DATE SHIPPED** 5-18-78 **DOW LAB FILE NO.**

I CERTIFY: that the material shipped has the following analysis:

	LOT NUMBERS				
	MM 32878	MM 04178	MM 03318	MM 32778	MM 04048
2,4,5-TCP-%	98.6	98.6	98.9	98.6	98.8
2,3,6-TCP-%	0.6	0.6	0.4	0.6	0.3
Dichlorophenol-%	0.6	0.7	0.4	0.6	0.4
Monochloromethoxyphenol-%	0.03	0.1	0.4	0.03	0.6
2,3,7,8-Tetrachlordibenzo--p-dioxin (ppm)	<0.01	<0.01	<0.01	<0.01	<0.01

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JUN - 5 1

THE DOW CHEMICAL COMPANY

BY Allen J. Howard

Allen J. Howard, Quality Assurance

STOCK FORM 7050 PRINTED R-11-70.

CERTIFICATE OF ANALYSIS

THE DOW CHEMICAL COMPAN

DESCRIPTION OF MATERIAL	DATE
2,4,5-Trichlorophenol (Purified)	5-18-78

DOW ORDER NO.	AMOUNT	CAR OR TRUCK NO
4241516		

LOT NUMBERS	CUSTOMER ORDER NO
See below.	

CUSTOMER NAME AND ADDRESS		CONTRACT NO. / DATE SHIPPED / DOW LAB FILE NO.
	Givaudan Corp. 100 Delawanna Ave. Clifton, NJ 07014 Attn: G. Von Essen	DATE SHIPPED 5-16-78

I CERTIFY: that the material shipped has the following analysis:

	Lot Numbers					
	MM04178	MM03278	MM03378	MM04148	MM04048	MM32
2,4,5-TCP ... %	98.6	98.6	98.9	98.7	98.8	98.
2,3,6-TCP ... %	0.6	0.6	0.4	0.5	0.3	0.
Dichlorophenols ... %	0.7	0.6	0.4	0.7	0.4	0.
Monochloromethoxyphenol ... %	0.1	0.03	0.4	0.2	0.6	0.
2,3,7,8 Tetrachlorodibenzo-p-dioxin (PPM)	<0.01	<0.01	< 0.01	<0.01	< 0.01	<0.

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MAY 31 1978
PURCHASING DEPARTMENT

RECEIVED at RESEARCH
JUN - 5 1978

THE DOW CHEMICAL COMPANY

BY Allen J. Howard
Allen J. Howard, Quality Assurance

STOCK FORM 7020 PRINTED 8-11-70

CARMINE T. PERRAPATO
CHAIRMAN
THOMAS J. CIFELLI
VICE CHAIRMAN
ROBERT J. DAVENPORT
BEN W. GORDON
JOSEPH M. KEEGAN
CHARLES A. LAGOS
COMMISSIONERS

PASSAIC VALLEY SEWERAGE COMMISSIONERS
600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800

SEYMOUR A. LUBETKIN
CHIEF ENGINEER
CHARLES C. CARELLA
CHIEF COUNSEL
MRS. CHARLES T. SCHAEDEL
CLERK-TREASURER

July 6, 1977

Rudy Lorenz
City Engineer
City Hall
1187 Main Avenue
Clifton, New Jersey 07015

Re: Pollution of Third River

Dear Mr. Lorenz:

This letter is in reference to a pollution of Third River caused by a leak in an 18 inch Clifton sanitary sewer which crosses Third River at River Road.

Laboratory analysis of a sample taken on June 22, 1977, indicated that a serious pollution of Third River exists.

It is imperative that this leak be repaired as quickly as possible. Please reply to this letter indicating what action you intend to take to eliminate the violation as well as a timetable for completion.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Frank P. D'Ascensio

Frank P. D'Ascensio

FPD:rv
Certified Mail

cc: S.A. Lubetkin
A.S. Goldberg
F. Cupo
L. Cuccinello
Inspector

RECEIVED
JUL 8 1977
Engineering Dept.
CL.

BBQ 000001

RESOLUTION

WHEREAS the Givaudan Corporation has agreed to bear the cost of installation, replacements or repairs and to assume all responsibility during the replacement and maintenance of a 16" cast iron sewer line with a 15" extra strong clay line beneath the Third River Bridge at River Road, Delawanna, Passaic County, New Jersey; and

WHEREAS the County Counsel recommends that permission be granted on the basis of a letter of agreement signed by said Company and dated November 30, 1953;

NOW THEREFORE BE IT RESOLVED by the Board of Chosen Freeholders of the County of Passaic that permission be and is hereby granted to the Givaudan Corporation to replace a 16" cast iron sewer line with a 15" extra strong clay line beneath the Third River Bridge at River Road, Delawanna, Passaic County, New Jersey; and

BE IT FURTHER RESOLVED that said work is to be done under the supervision of and subject to the approval of the Passaic County Engineer, and in accordance with plans hereto attached and made a part hereof, it being expressly understood and agreed that such replacement shall be made at the sole and exclusive expense of the Givaudan Corporation and that all liability for property damage and personal injury is assumed by the Givaudan Corporation during installation and subsequent maintenance.

Vincent A. Pernetti
Chairman of the Bridge Committee

Dated: December 2nd, 1953.

November 30, 1953

Mr. Nicholas Martini,
County Counsel,
Administration Building,
Paterson 1, New Jersey.

Dear Mr. Martini:

Enclosed please find copy of plan for replacement of the 16 inch cast iron sewer line with a 15 inch extra strong clay line beneath the Third River Bridge at River Road, Delawanna, New Jersey.

The Givaudan Corporation agrees to defray the cost of this operation together with the cost to the County of any replacement or repairs. The Givaudan Corporation will also assume all responsibility for this work and for any damage or injury which may result from the installation and during the maintenance thereof.

Yours very truly,

THE GIVAUDAN CORPORATION

Vice-President

M. Luthy:jmb

Encl.

cc to City of Clifton,
Engineering Dept.

City of Clifton,
Bureau of Engineering,
City Hall,
Clifton, N.J. Att: Mr. W. Holster, City Engineer.

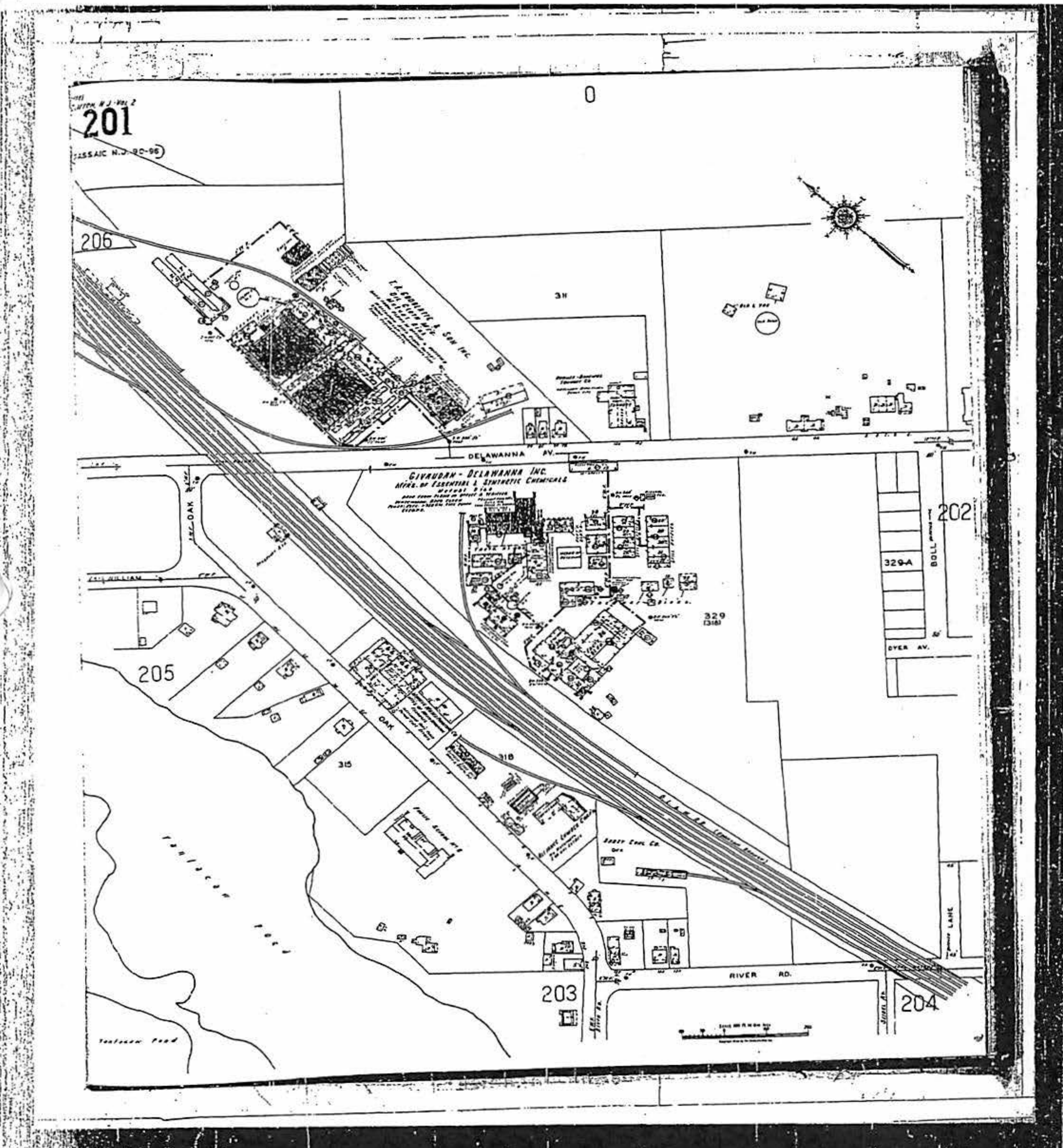
Gentlemen:

In "assuming responsibility during the maintenance" our company does not waive the understanding expressed in the City of Clifton, Bureau of Engineering letter of August 20, 1946 in which the City of Clifton accepted the sewer line in question for maintenance. All questions regarding maintenance raised by the county will be referred to the City of Clifton, the owner of the sewer line, as heretofore.

Very truly yours,

THE GIVAUDAN CORPORATION

cc to Mr. W. Ross Vice-President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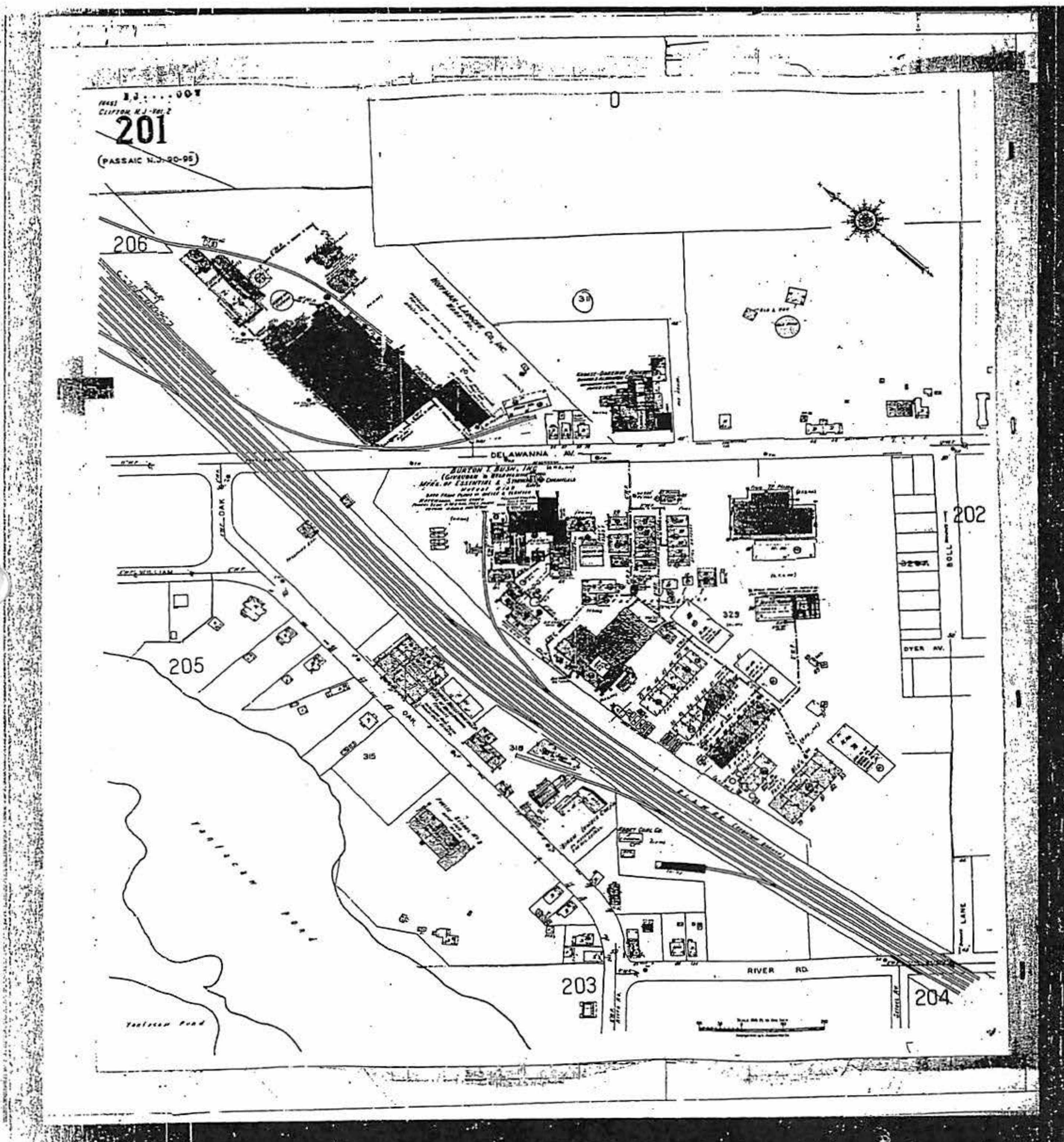
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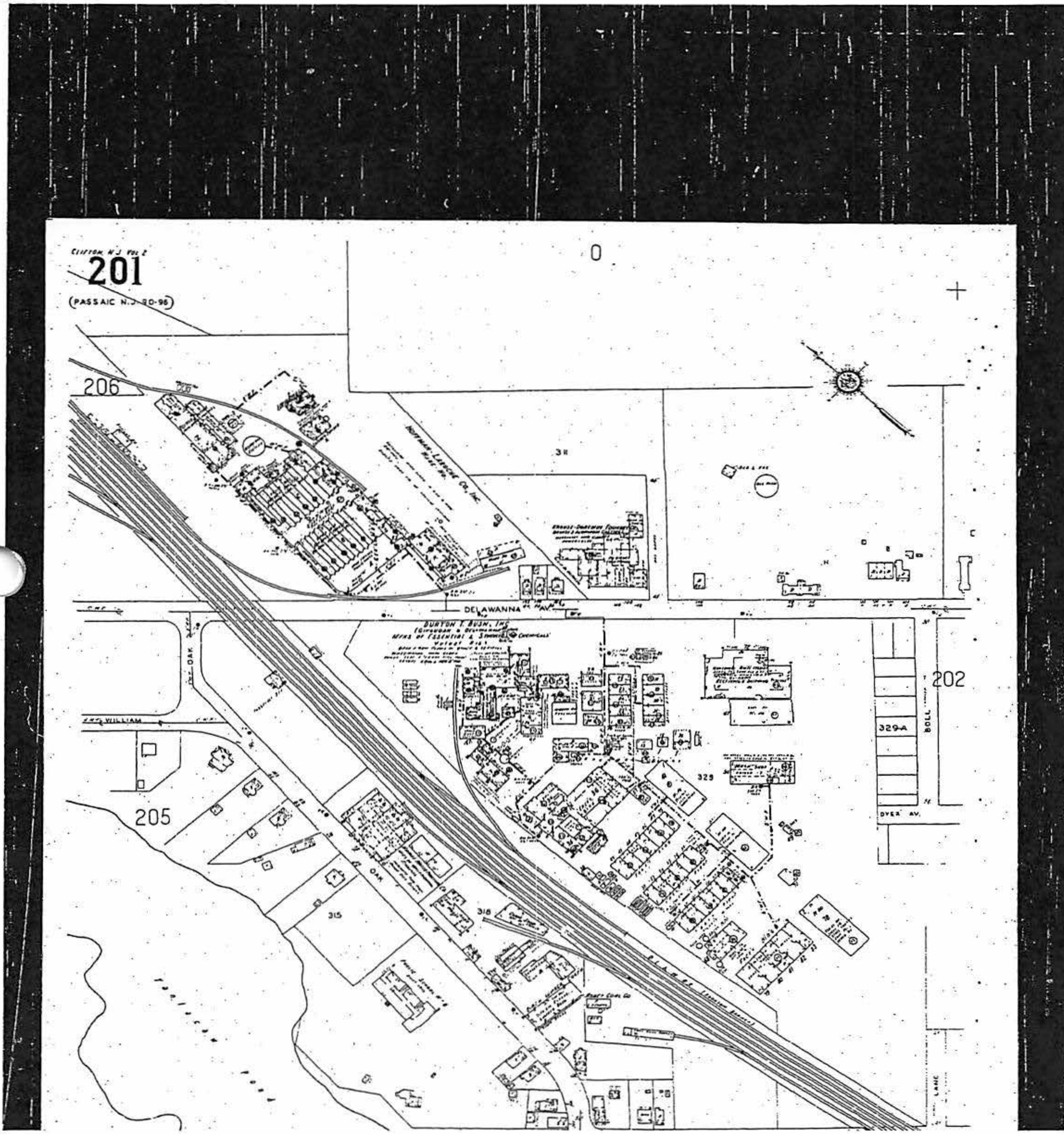
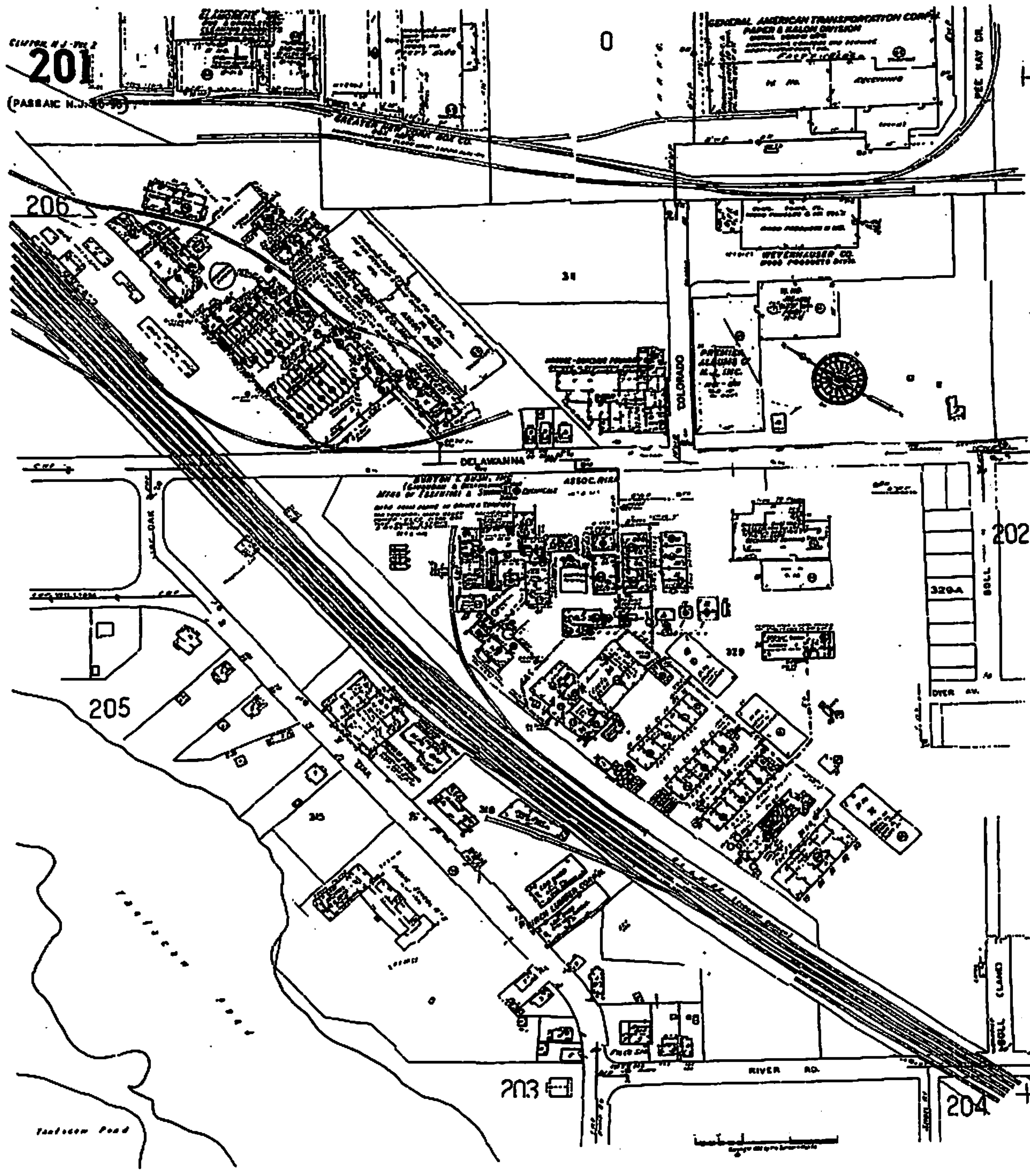


The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1952 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)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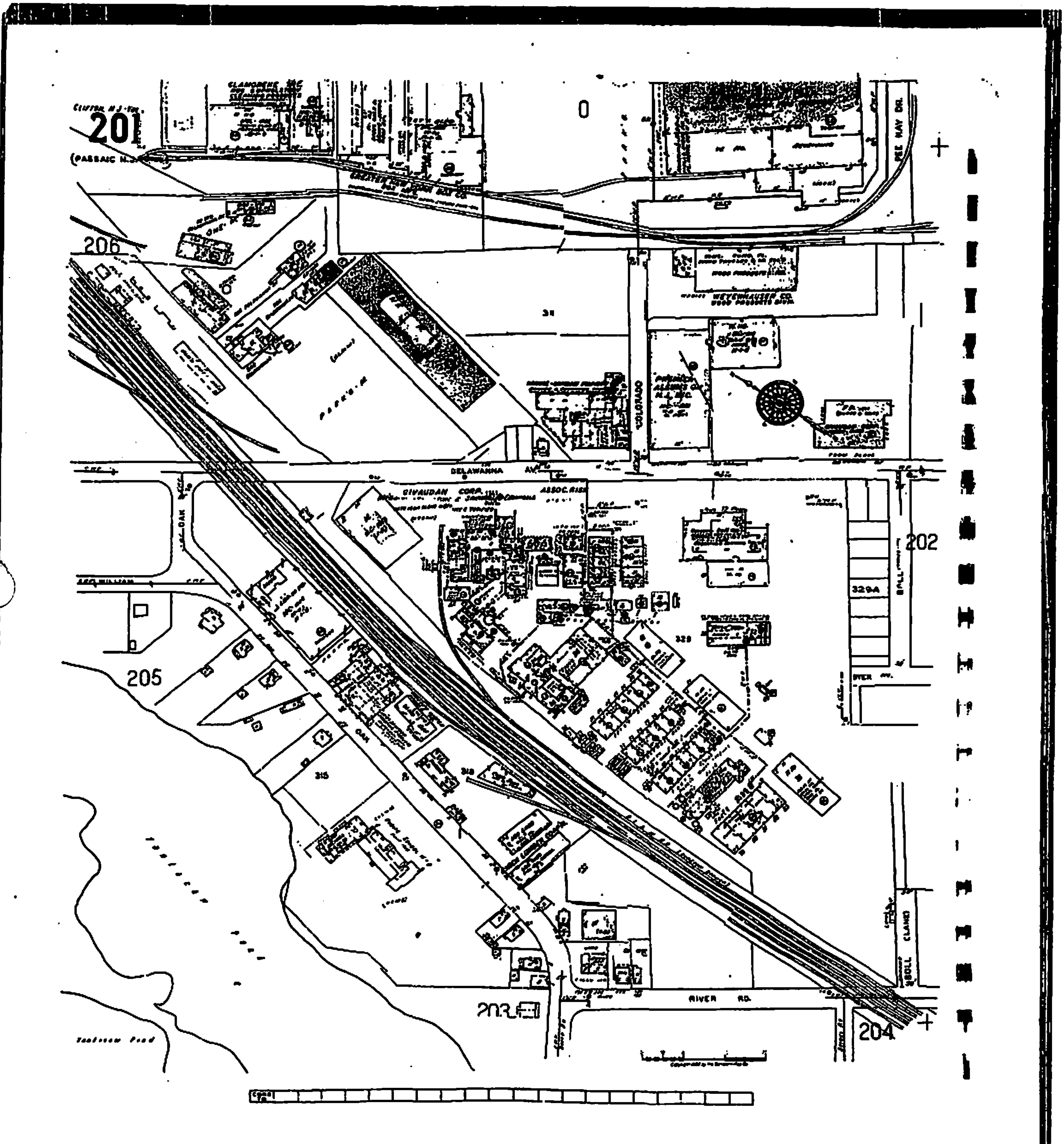
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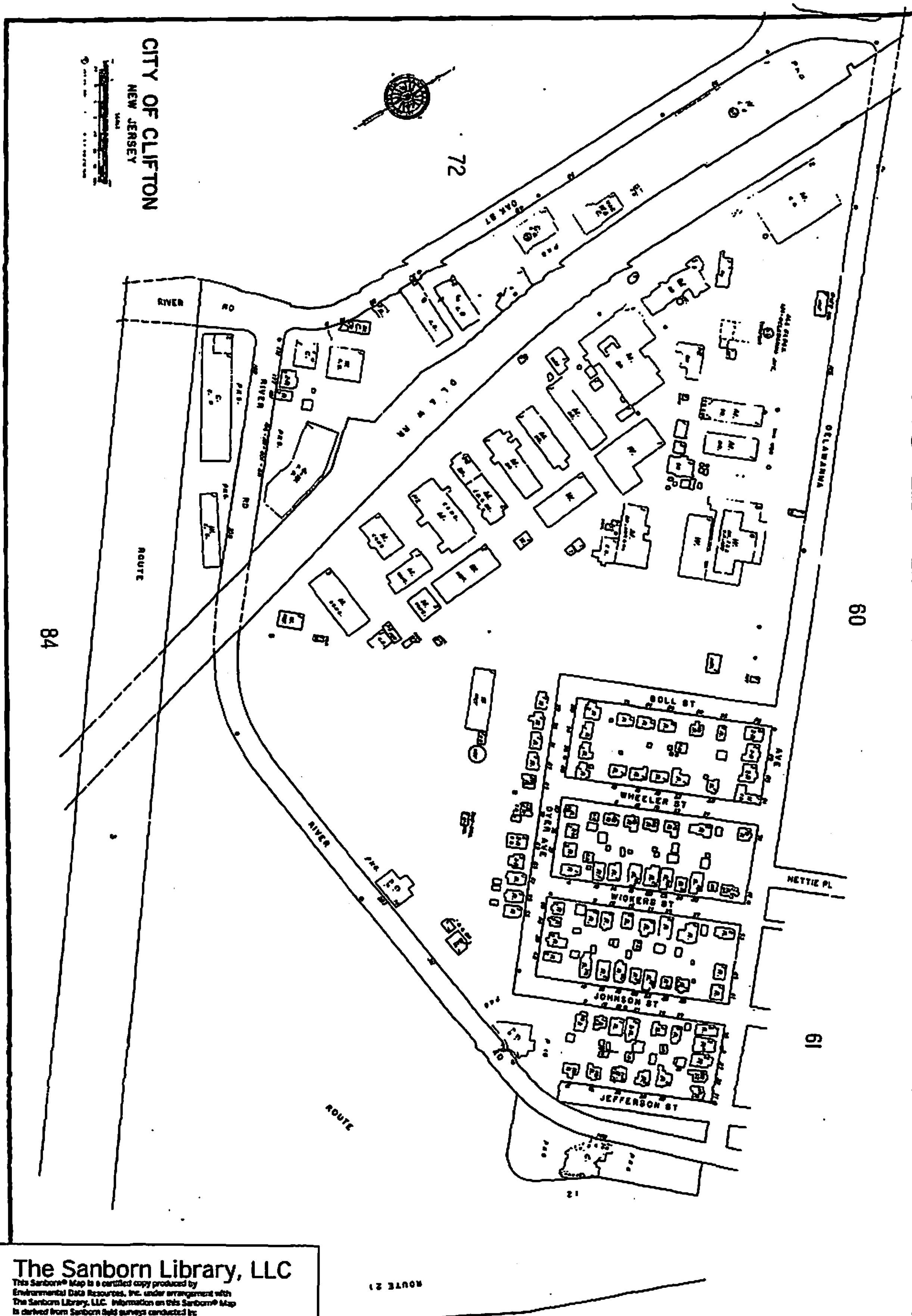
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WHEELER ST
WICKERS ST
JOHNSON ST
JEFFERSON ST
NETTIE PL
DYER AVE
ROUTE 21

73

COMMITMENT FOR TITLE INSURANCE
ISSUED BY

Title No. 98-LT-0846

Sanctity of Contract

STEWART TITLE
GUARANTY COMPANY

STEWART TITLE GUARANTY COMPANY, A Texas Corporation, herein called the Company, for a valuable consideration, hereby commits to issue its policy or policies of title insurance, as identified in Schedule A, in favor of the proposed Insured named in Schedule A, as owner or mortgagee of the estate or interest covered hereby in the land described or referred to in Schedule A, upon payment of the premiums and charges therefor; all subject to the provisions of Schedules A and B and to the Conditions and Stipulations hereof.

This Commitment shall be effective only when the identity of the proposed Insured and the amount of the policy or policies committed for have been inserted in Schedule A hereof by the Company, either at the time of the issuance of this Commitment or by subsequent endorsement.

This Commitment is preliminary to the issuance of such policy or policies of title insurance and all liability and obligations hereunder shall cease and terminate nine months after the effective date hereof or when the policy or policies committed for shall issue, whichever first occurs, provided that the failure to issue such policy or policies is not the fault of the Company.

Signed under seal for the Company, but this Commitment shall not be valid or binding until it bears an authorized Countersignature.

IN WITNESS WHEREOF, Stewart Title Guaranty Company has caused its corporate name and seal to be hereunto affixed by its duly authorized officers on the date shown in Schedule A.

STEWART TITLE
GUARANTY COMPANY

Stewart Morris Jr.
Chairman of the Board

Malcolm S. Morris
President

STEWART TITLE GUARANTY CO. INCORPORATED 1908 TEXAS

Countersigned by:

Peter E Royal Esquire

Authorized Signatory

Peter E. Royal, Esq.

LAND TITLE AGENCY, INC.
464 Valley Brook Avenue
Lyndhurst, NJ 07071

(201) 804-8844

Serial No. C-4401- 361990

Title No. 98-LT-0846

SCHEDULE A

1. **Effective date:** December 15, 1998 **redated:** **by:**

redated: **by:**

2. **Policy or Policies to be issued:**

(a) [X] **Commercial Title Insurance Policy** $TBA
ALTA Owner's Form
(10-17-92)

Proposed Insured:
TBA

(b) [X] **ALTA Loan Policy** $TBA
(10-17-92)

Proposed Insured:
TBA

3. **The fee simple estate or interest in the land described or referred to in the Commitment and covered herein is and is at the effective date hereof vested in:**

SEE ATTACHED VESTING SCHEDULE

4. **The land referred to in this Commitment is described as follows: (If not described here, as on the description sheet next attached hereto.)**

Title No. 98-lt-0846

VESTING SCHEDULE

Givaudan Roure Fragrance Corporation by Deed from Givaudan Roure Corporation dated January 1, 1998 and recorded January 8, 1998 in the Office of the Register of the County of Passaic in Deed Book P153 page 79.

(a) Parcel 1 - Burton T. Bush, Inc. by Deed from Antoine Chiris Company dated March 1, 1924 and recorded March 8, 1924 in Deed Book C31 page 184.

(b) Parcel 2 - Burton T. Bush, Inc. by Deed from Antoine Chiris Company dated August 14, 1924 and recorded March 24, 1925 in Deed Book X31 page 97.

(c) Parcel 3 - Deed from William L. Sweet, Jr. and Ruth Bigelow Sweet to Burton T. Bush, Inc. dated December 5, 1939 and recorded December 6, 1939 in Deed Book C41 page 407.

(d) Parcel 4 - Deed from The Morris and Essex Railroad Company and the Delaware and Lackawanna and Western Railroad Company to Burton T. Bush, Inc. dated October 6, 1941 and recorded November 21, 1941 in Deed Book N42 page 484.

(e) Parcel 5 - Deed from City of Clifton to Burton T. Bush, Inc. dated October 25, 1945 and recorded May 8, 1946 in Deed Book T45 page 431.

(f) Parcel 6 - Deed from City of Clifton to Burton T. Bush, Inc. dated October 25, 1945 and recorded May 8, 1946 in Deed Book T45 page 434.

(g) Parcel 7 - Deed from City of Clifton to Burton T. Bush, Inc. dated April 17, 1946 and recorded May 8, 1946 in Deed Book T45 page 432.

(h) Parcel 8 - Deed from State of New Jersey to The Givaudan Corporation dated February 11, 1960 and recorded March 31, 1960 in Deed Book C73 page 569.

(i) Parcel 9 - Deed from Albert Rau to The Givaudan Corporation dated March 29, 1960 and recorded April 8, 1960 in Deed Book E73 page 44.

(j) Parcel 10 - Deed from Emanuel Weitzner and Gertrude Weitzner, his wife to Givaudan Corporation dated December 7, 1967 and recorded November 3, 1969 in Deed Book G88 page 490.

(Continued)

(k) Parcel 11 - Deed from Erie-Lackawanna Railroad Company to Givaudan Corporation dated December 11, 1967 and recorded April 29, 1968 in Deed Book Z85 page 302.

(l) Parcel 12 - Deed from Riocahrd Barrisrur, Mafalda and Dante Pavin and Ida and Mario Calligaro to Givaudan Corporation dated June 20, 1968 and recorded June 21, 1968 in Deed Book F86 page 289.

(m) Parcel 13 - Deed from Lena Goggins to Givaudan Corporation date September 27, 1968 and recorded September 27, 1968 in Deed Book R86 page 463.

(n) Parcel 14 - Deed from Harry Washington, Jr. and Lorraine Helen Washington, his wife to Givaudan Corporation dated October 19, 1968 and recorded October 21, 1968 in Deed Book U86 page 249.

(o) Parcel 15 - Deed from Ontell Realty Co., Inc. to Givaudan Corporation dated November 1, 1968 and recorded October 23, 1969 in Deed Book F88 page 477.

(p) Parcel 16 - Deed from City of Clifton to Givaudan Corporation dated November 6, 1968 and recorded November 19, 1968 in Deed Book X86 page 170.

(q) Parcel 17 - Deed from Hofman-LaRoche, Inc. to Givaudan Corporation dated June 9, 1969 and recorded June 10, 1969 in Deed Book R87 page 16.

(r) Parcel 18 - Deed from Sameuel Weinstein and Olga Weinstein, his wife and Marvin Balkin and Mary R. Balkin, his wife to Givaudan Corporation dated January 15, 1971 and recorded January 17, 1971 in Deed Book A90 page 403.

(s) Parcel 19 - Deed from Sindar, Inc. to Givaudan Corporation dated December 17, 1971 and recorded July 5, 1972 in Deed Book L92 page 470.

(t) Parcel 20 - Deed from James R. White and Betty White, his wife to Givaudan Corporation dated December 4, 1972 and recorded December 6, 1972 in Deed Book F93 page 246.

(u) Parcel 21 - Deed from City of Clifton to Givaudan Corporation dated December 6, 1977 and recorded December 13, 1977 in Deed Book D101 page 581.

(Continued)

(v) Parcel 22 - Deed from Robert Carniel, also known as Robert L. Carniel and Rose Carniel, his wife to Givaudan Corporation dated March 8, 1978 and recorded March 9, 1978 in Deed Book N101 page 525.

(w) Parcel 23 - Deed from Irving Ehrenfeld and Anne S. Ehrenfeld, his wife and Shirley Greet and David M. Green, her husband and Edward Ehrenfeld and Martha Ehrenfeld, his wife and Helen Zahler, a widow and Esther Cohen, a widow and Mildred Kramer and Julis E. Kramer, her husband and David N. Ehrenfeld and Joan Ehrenfeld, his wife and Lester L. Green and Ruth T. Green, his wife and Marvin M. Green and Marcia R. Green, his wife to Givaudan Corporation dated December 23, 1982 and recorded January 17, 1983 in Deed Book R109 page 5.

Land Title Agency, Inc.
464 Valley Brook Avenue
Lyndhurst, NJ 07071
(201)804-8844

Title No. 98-LT-0846

DESCRIPTION

ALL that certain tract or parcel of land and premises, situate, lying and being in the City of Clifton, in the County of Passaic, and State of New Jersey, more particularly described as follows:

A metes and bounds description will be supplied upon receipt of a current accurate survey.

FOR INFORMATION ONLY:

Being known as Lots 22, 26, 27, 28, 29 and 30 in Block 60.14, Lots 20, 26, 27 and 38 in Block 61.03 and Lots 2, 102 and 104 in Block 73-3 on the Official Tax Map of the City of Clifton in the County of Passaic and State of New Jersey.

Being also known as Delawanna Avenue .

SCHEDULE B-SECTION 1

The following are the requirements to be complied with:

1. **Document(s) satisfactory to us creating the interest in the land and/or the mortgage to be insured must be signed, delivered and recorded:**

   Deed made by present owner(s) to the proposed insured(s) named in Schedule A, 2(a).

   Mortgage made by purchaser(s) to the proposed insured(s) named in Schedule A, 2(b).

2. **Pay the agreed amounts for the interest in the land and/or the mortgage to be insured.**

3. **Pay us the premiums, fees and charges for the Policy with certified funds.**

4. **You must tell us in writing the name of anyone not referred to in this Commitment who will get an interest in the land or who will make a loan on the land. We may then make additional requirements or exceptions.**

5. **An affidavit of title executed by the seller(s)/mortgagor(s) must be obtained and the facts set forth therein must be considered.**

6. **If the present transaction consists of a sale by a corporation, a certified copy of the Resolution of the Board of Directors authorizing the transaction together with a certificate that the corporation is in good standing and that the By-Laws have been complied with must be obtained.**

7. New Jersey Superior Court, United States District Court and United States Bankruptcy Court Searches disclose a judgment or judgments which are to be discharged of record or disposed of by a specific affidavit which states said judgments are not against our party but rather a party of similar name.

8. The Company requires that a Notice of Settlement in connection with this transaction be filed, pursuant to N.J.S.A. 46:16A-1 et seq., as nearly as possible to (but not more than) forty-five (45) days prior to the anticipated closing date. If the closing is postponed to a date which is more than forty-five (45) days after the filing of the Notice of Settlement, another Notice of Settlement must be filed in a timely fashion (see attached sample).

(Continued)

9. Title Insurance Policy Closing Letter must be completed and returned to this office.

10. A Rundown (continuation of title commitment) must be ordered 48 hours in advance of the date of closing.

11. State UCC-1 search VS. Givaudan Roure Fragrance Corp., shows no record. This Company assumes no responsibility for the accuracy of the within UCC searches from the Secretary of State's Office. The searching was conducted by employees of the Secretary of State and the records are within their custody and control.

12. Corporate Status Report VS Givaudan Roure Fragrance Corp. shows that the name of the corporation was changed to Givaudan Roure Corporation on December 31, 1997 and is an active corporation as of January 21, 1999.

13. Subject to Franchise Tax Report VS Givaudan Roure Fragrance Corp. on order, not yet received.

Title No. 98-LT-0846

SCHEDULE B - SECTION 2

Schedule B of the policy or policies to be issued will contain exceptions to the following matters unless the same are disposed of to the satisfaction of the Company:

1. Rights, or claims of parties in possession not shown by the public records.

2. Easements, or claims of easements, not shown by the public record.

3. Any facts about the land which a correct survey would disclose and which are not shown by the public records.

4. Any liens against your title, arising now or later, for labor material, not shown by the public records.

5. Taxes, charges and assessments as set forth in the schedule(s) annexed.

6. The 0 mortgage(s) and assignment(s) as described on the attached sheet.

7. Computed measure of the area and/or acreage is not insured to be accurate.

8. As to Owner's Policy only: Subject to sub-surface conditions and/or encroachments not disclosed by an instrument of record.

9. Subject to the rights of tenants.

10. Parcel 2 - Subject to Grants, Easements, Reservation and Slope and Drainage Rights as set forth in Deed Book X72 page 605. Public and private rights in lands formerly within the bed of Boll Street.

11. Parcel 3 - Subject to Easements and Reservations as set forth in Deed Book E28 page 59 and Deed Book C41 page 407.

12. Parcel 4 - Subject to Easement and Reservations as set forth in Deed Book N42 page 484.

13. Parcel 5 - Subject to Public and private rights in lands formerly within the bed of Boll Street.

14. Parcel 7 - Subject to Easements and Reservations and Slope and Drainage Rights as set forth in Deed Book X72 page 605.

(Continued)

15. Parcel 8 - Subject to Easements and Reservations and Slope and Drainage Rights of the State of New Jersey as shown on "New Jersey State Highway Department General Property Parcel Map Route 21 Freeway Section 1", and as set forth in Deed Book P71 page 522 and C73 page 569.

16. Parcel 9 - Subject to Easements Reservations and Slope and Drainage Rights of the State of New Jersey as shown on "New Jersey State Highway Department General Property Parcel Map Route 21 Freeway Section 1", and as set forth in Deed Book P71 page 522.

17. Parcel 11 - Subject to Easements and Reservations as set forth in Deed Book Z85 page 302, T62 page 41 and E63 page 85.

18. Parcel 12 - Subject to Public and private rights in lands formerly within the bed of Boll Street.

19. Parcel 13 - Subject to Easements and Reservations as set forth in Deed Book S91 page 480.

20. Parcel 15 - Subject to Easements and Reservations as set forth in Deed Book Y43 page 324, Deed Book Y43 page 493 and Deed Book B44 page 198. Terms of Agreement set forth in Deed Book C47 page 91, E138 page 122 and X91 page 172.

21. Parcel 16 - Subject to Easements and Reservations as set forth in Deed Book X86 page 170.

22. Parcel 17 - Subject to Public and private rights in lands formerly within the bed of any current or former streets, roads and ways crossing or bounding the subject lands. Easements and Reservations as set forth in Deed Book K43 page 532, Deed Book S43 page 139, Deed Book S43 page 143, Deed Book X43 page 285, Deed Book A46 page 483, Deed Book O55 page 131, Deed Book O55 page 136, Deed Book H66 page 102, Deed Book M66 page 310, Deed Book Z68 page 597, Deed Book Z68 page 603, Deed Book D89 page 22, Deed Book K 119 page 460, Deed Book K119 page 464, Deed Book K119 page 472, Deed Book P119 page 325 and Deed Book L132 page 216. Terms of Agreement set forth in Deed Book C47 page 91.

23. Parcel 18 - Subject to Easements and Reservations as set forth in Deed Book Z60 page 342 and Deed Book N88 page 597.

(Continued)

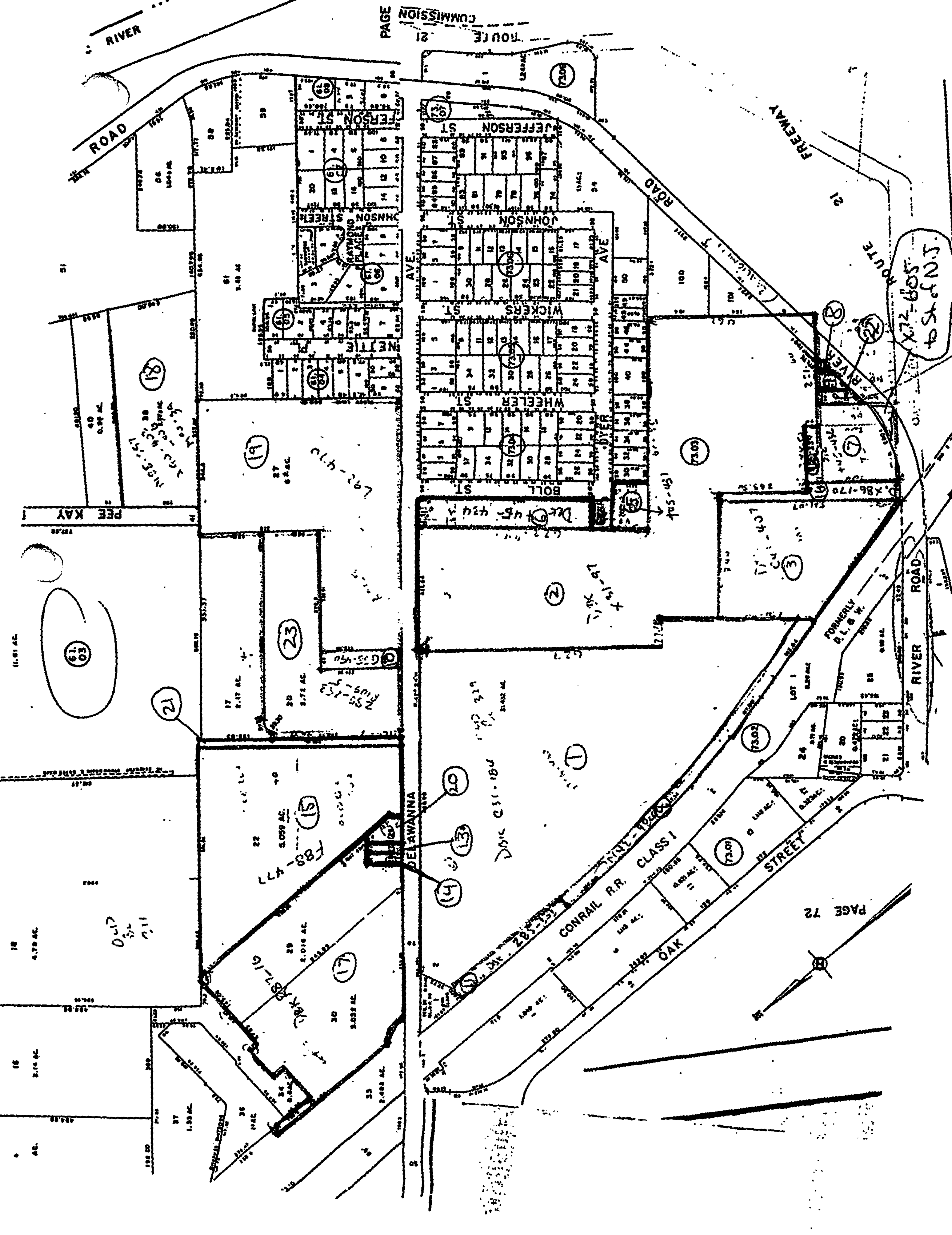
24. Parcel 21 - Subject to Public private rights in lands formerly within the bed of any current or former streets, roads or ways crossing or bounding the subject lands. Easements and Reservations as set forth in Deed Book D101 page 581.

25. Parcel 22 - Subject to Easements and Reservations and Slope and Drainage Rights of the State of New Jersey as shown on "New Jersey State Highway Department General Property Parcel Map Route 21 Freeway Section 1", and Deed Book D78 page 70.

26. Parcel 23 - Subject to Public and private rights in lands formerly within the bed of any current or former streets, roads or ways crossing or bounding the subject lands. Easements and Reservations as set forth in Deed Book T63 page 161, Deed Book H79 page 530, Deed Book H79 page 534, Deed Book 179 page 323, Deed Book 179 page 327 and Deed Book F101 page 579 and C100 page 183. Vacation of Colorado Street recorded in Vacation Book 5 page 156.

27. Subject to easements as set forth in Deed Book X76 page 515, H68 page 38, H88 page 281, A90 page 406, D78 page 70 and C100 page 181.

28. Subject to financing statement no 58616 filed March 12, 1992 and continued November 13, 1996.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PEE KAY
DELAWANNA
CONRAIL R.R. CLASS I
FORMERLY D.L.&W.
RIVER ROAD
OAK STREET
PAGE 72

GIVAUDAN CORPORATION

I

SUPPL NEW CORRES

125 Delawanna Avenue
Clifton, N. J. 07014
Phone: (201) 777-074

August 18, 1970

Director of Bureau of Drugs
F.D.A.
200 C Street S.W.
Washington, D. C. 20204

Subject: Additions to the Master File on hexachlorophene of Givaudan Corp., Clifton, N.J. (formerly Sindar Corp., a Division of Givaudan Corp.), ref. NDA 344

Dear Sirs:

Enclosed please find two additions to our above mentioned master file on hexachlorophene, namely 3 copies each of

a) a paper on "Photodegradation of Hexachlorophene"

b) a document entitled "Investigations concerning the possible presence of 2,3,7,8-tetrachlorodibenzo-p-dioxin in Givaudan's commercial Hexachlorophene".

Both additions contain very significant contributions in regard to the safety of use of hexachlorophene. It is hoped that this information will become known to all those at FDA concerned with hexachlorophene.

Respectfully submitted,

GIVAUDAN CORPORATION

H. U. Daeniker, Ph.D.
Vice President of Research

HUD:am
Encl.

RECEIVED 1 COPY
FOR DOF ___ TRIP ___

RECEIVED
BUREAU OF DRUGS

Photochemistry and Photobiology. 1971. Vol. 13, pp. 347–355. Pergamon Press. Printed in Great Britain

PHOTODEGRADATION OF HEXACHLOROPHENE AND RELATED POLYCHLORINATED PHENOLS

G. W. SHAFFER, E. NIKAWITZ, M. MANOWITZ and H. U. DAENIKER
Givaudan Corporation, 125 Delawanna Avenue, Clifton, New Jersey 07014, U.S.A.

(*Received* 20 *August* 1970; *in revised form* 9 *October* 1970)

Abstract—Irradiation of hexachlorophene in absolute ethanol yields a series of dechlorinated bisphenols resulting from loss of chlorine at the *ortho* and *para* positions relative to the hydroxy groups. The two primary photoproducts, 2,2'-dihydroxy-3,3',5,6,6'-pentachlorodiphenylmethane and 2,2'-dihydroxy-3,5,5',6,6'-pentachlorodiphenylmethane were identified by independent syntheses.

INTRODUCTION

HEXACHLOROPHENE[1] is the most widely used skin bacteriocide and bacteriostat; therefore, in many applications it is exposed to sunlight while in contact with the human skin. Consequently, it was of interest to study the photochemistry of hexachlorophene. It would be most desirable to study the irradiation under the actual conditions of use, i.e., in the presence of moisture, air, organic skin material, etc. However, initially it was felt that the variables should be limited in order to elucidate the basic primary photodegradations of hexachlorophene. Therefore, these studies were done in ethanol in the absence of moisture and oxygen.

METHODS

Irradiations were carried out with a 450 W medium pressure Hanovia mercury lamp in a quartz immersion probe. The filters were glass cylinders (Pyrex (> 290 nm), Corex (> 255 nm) insertable between the lamp and the probe. Solutions were outgassed with argon before and during the irradiations.

I.R. Spectra were taken as potassium bromide pellets on a Perkin-Elmer 457 and absorptions are reported as inverse centimeters, nmr spectra were taken on a Varian A-60A as acetone-d_6 solutions and are reported as τ units relative to TMS (τ 10·0). NMR positions of the phenolic proton resonances are not reported as they were quite variable. Melting points were taken with a Buchi oil bath apparatus and are uncorrected; molecular weights were determined from mass spectra obtained with a Perkin-Elmer 270. Gas liquid chromatography (glc) was done with a 20 per cent UCW98 on 100–120 mesh gas chrom Q column (18 in. × ⅛ in.).

The diacetates described in Table 1 were prepared from the appropriate bisphenol by treatment with acetic anhydride and pyridine at 60°.

RESULTS

Irradiation of hexachlorophene. A solution of 3·00 g of hexachlorophene[1] in 150 ml of absolute ethanol (0·0491 *M*) was irradiated for 5 hr using Corex-filtered (> 260 nm) light. Solvent was removed under reduced pressure, the residual partially crystalline oil (3·91 g) was acetylated, and the crude diacetate mixture (3·07 g) was chromatographed on 275 g of silica gel, which was slurry packed with 9 to 1 hexane–

Table 1. Spectral and analytical data for synthetic chlorinated bisphenol diacetates

Compound	m.p.	mol. wt.	i.r. spectrum	nmr spectrum	Anal.
2	176–178°	488	1770, 1420, 1365 1140–1190, 1004 939, 858, 783	2·30 (2H, s, aromatic H) 5·64 (2H, s, methylene H) 7·79 (6H, s, methyl H)	Calcd. for $C_{17}H_{10}O_4$: C, 41·55; H, 2·04; Cl, 43·38. Found: C, 41·75; H, 2·13; Cl, 43·37.
4	130·5–132·5°	454	1770, 1420, 1365, 1170, 1006, 954, 931, 860.	2·17 (1H, s, aromatic H in pentasubstituted ring) 2·47 (2H, s, aromatic H) 5·62 (2H, s, methylene H) 7·73 and 7·78 (6H, two s, methyl H)	Calcd. for $C_{17}H_{11}Cl_5O_4$: C, 44·69; H, 2·41; Cl, 38·88. Found: C, 44·47; H, 2·35; Cl, 38·72.
6	132·5–134·0°	454	1770, 1430, 1370, 1180, 1010, 962, 866.	2·18 (1H, s, aromatic H in pentasubstituted ring) 2·37 (1H, d of AB q, J = 9 Hz, aromatic H) 2·79 (1H, d of AB q, J = 9 Hz, aromatic H). 5·58 (2H, s, methylene H) 7·77 and 7·83 (6H, two s, methyl H)	Calcd. for $C_{17}H_{11}Cl_5O_4$: C, 44·69; H, 2·41; Cl, 38·88. Found: C, 44·87; H, 2·45; Cl, 38·79.
8*	156–157·5°	420	1770, 1442, 1367, 1174, 1140, 1008, 946, 887, 845, 804.	2·52 (4H, s, aromatic H) 5·71 (2H, s, methylene H) 7·79 (6H, s, methyl H)	Calcd. for $C_{17}H_{12}Cl_4O_4$: C, 48·34; H, 2·84; Cl, 33·65. Found: C, 48·38; H, 2·72; Cl, 33·41.
10	132–134°	420	1763, 1370, 1179, 958, 815.	2·44 and 2·85 (2H, AB q, J = 9 Hz, H at C_3' and C_4') 2·55 (2H, s, H at C_4 and C_5) 5·69 (2H, s, methylene H) 7·83 and 7·85 (6H, two s, methyl H)	Calcd. for $C_{17}H_{12}Cl_4O_4$: C, 48·34; H, 2·84; Cl, 33·65. Found: C, 48·44; H, 2·79; Cl, 33·89.
12*	169–171°	420	1767, 1455, 1368, 1212, 1181, 1124, 1011, 959, 891, 871.	2·40 (2H d of AB q, J = 9 Hz, aromatic H) 2·82 (2H, d of AB q, J = 9 Hz, aromatic H) 5·60 (2H, s, methylene H) 7·88 (6H, s, methyl H)	Calcd. for $C_{17}H_{12}Cl_4O_4$: C, 48·34; H, 2·84; Cl, 33·65. Found: C, 48·30; H, 2·82; Cl, 33·50.

*Synthesis of the corresponding bisphenol is described in ref. [1].

ethyl acetate into a 2·5 × 68 cm column. The column was eluted with 9 to 1 hexane–ethyl acetate and 50 ml fractions were taken.

Fractions 4–18 contained hexachlorophene diacetate (2) (1·595 g, 44 per cent) which was identical (nmr, glc) with a synthetic sample (Table 1).

Fractions 4–18 also contained 2,2′-diacetoxy-3,3′,5,6,6′-pentachlorodiphenylmethane [4] (0·579 g, 17 per cent), glc retention time relative to 2 equaled 0·64–0·69; mol. wt. 454. Diacetate 4 was separated from 2 in 80–90 per cent purity by autoprep glc collection (2 per cent SE30, 2 ft × ¼ in., 200°C) and was identical (i.r. and nmr, glc) with a synthetic sample (Table 1). Hydrolysis of a mixture of 60 per cent 2 and 40 per cent 4 from the chromatogram gave a mixture of bisphenols shown by the nmr spectrum to be composed of hexachlorophene and 2,2′-dihydroxy-3,3′,5,6,6′-pentachlorodiphenylmethane.

Fractions 14–37 contained 2,2′-diacetoxy-3,5,5′,6,6′-pentachlorodiphenylmethane (6) (0·527 g, 16 per cent); glc retention time relative to 2 equaled 0·78–0·79; mol. wt. 454.

Fractions 28–34 contained 6 in 80–85 per cent purity, which was essentially identical (i.r. and nmr spectra, glc) to a synthetic sample (Table 1). Recrystallization of the combined fraction from isopropanol gave 6 as white graunular crystals (89 per cent purity by glc) which melted as follows: irradiation sample m.p. 130–132°C, synthetic sample m.p. 132·5–134·0°C, mixed m.p. 131–136°C.

Fractions 6–20 contained small amounts (1–11 per cent per fraction) of a product which was tentatively identified as 2,2′-diacetoxy-3,3′,6,6′-tetrachlorodiphenylmethane 8 (0·055 g, 2 per cent); glc retention time relative to 2 equaled 0·42–0·45. The assignment was made on the basis of an identical glc retention time to that of a synthetic sample (Table 1).

Fractions 22–38 contained a product which was not isolated but tentatively identified as 2,2′-diacetoxy-3,5′,6,6′-tetrachlorodiphenylmethane (10) (0·086 g, 3 per cent); glc retention time relative to 2 equaled 0·52–0·53. The assignment was made on the basis of an identical glc retention time to that of a synthetic sample (Table 1).

The other expected secondary photoproduct, 2,2′-diacetoxy-5,5′,6,6′-tetrachlorodiphenylmethane (12) was not detected in the irradiation mixture.

The remaining 18 per cent of the photolysis mixture was a mixture of several other unidentified products including colored material which was not eluted from the chromatogram.

Irradiation of 1 in absolute ethanol using Pyrex-filtered (> 290 nm) light paralleled the Corex irradiation, although the rate of reaction was slower.

An ethanolic solution of hexachlorophene in the dark for 10 days gave none of the above observed products.

Irradiation of 2,2′-Dihydroxy-3,5,5′,6,6′-pentachlorodiphenylmethane (5). A solution of 2·00 g of 2,2′-dihydroxy-3,5,5′,6,6′-pentachlorophenylmethane in 150 ml of absolute ethanol (0·035 *M*) was irradiated for 4 hr using Corex-filtered light. Solvent was removed under reduced pressure and the residual brown crystalline material (2·43 g) was acetylated and the crude diacetate mixture (2·51 g) was chromatographed as above.

Fractions 25–34 contained 2,2′-diacetoxy-3,5,5′,6,6′-pentachlorodiphenylmethane (6) (0·519 g, 21 per cent), which was identical (nmr, glc) with a synthetic sample.

Fractions 25–46 contained 2,2′-diacetoxy-3,5′,6,6′-tetrachlorodiphenylmethane (10) (0·454 g, 20 per cent), glc retention time relative to 6 equaled 0·62–0·69; mol. wt.

420. Fractions 35–41 (86 per cent pure) were recrystallized twice from isopropanol to give white needles (91 per cent pure, m.p. 124·5–127·0°C) which were essentially identical (nmr, glc, mixed m.p. 126–132°C) to a pure synthetic sample at 2,2'-diacetoxy-3,5',6,6'-tetrachlorodiphenylmethane (10) (m.p. 132–134°C).

The eluant was changed to methanol and three 1–1 fractions, (F-47-49) were collected. The major component of these fractions (64 per cent, 0·589 g, 26 per cent yield, glc retention time relative to 6 equaled 0·79–0·81) was isolated as almost colorless needles (m.p. 168–170°C) by several recrystallizations of fraction 47 from isopropanol, using charcoal to decolorize, and identified as 2,2'-diacetoxy-5,5',6,6'-tetrachlorodiphenylmethane (12) (mol. wt. 420) by comparison (nmr, glc, mixed m.p. 169–171·5°C) with a synthetic sample (m.p. 169–171°C).

The remaining 33 per cent of the photolysis mixture was a mixture of several other unidentified products including colored material.

Irradiation of 2,2'-Dihydroxy-3,3',5,6,6'-pentachlorodiphenylmethane (3). A solution of 2·50 g of 2,2'-dihydroxy-3,3',5,6,6'-pentachlorodiphenylmethane in 150 ml of absolute ethanol (0·044 *M*) was irradiated for 5 hr using Corex-filtered light. Solvent was removed under reduced pressure and the résidual brown oil (3·40 g) was acetylated and the crude diacetate mixture (3·28 g) was chromatographed as above.

Fractions 12–19 contained 2,2'-diacetoxy-3,3',5,6,6'-pentachlorodiphenylmethane (4) (1·396 g, 46 per cent), which was identical (nmr, i.r., glc) with a synthetic sample.

Fractions 17–23 contained 2,2'-diacetoxy-3,3',6,6'-tetrachlorodiphenylmethane (8) as the major component (0·504 g, 18 per cent yield), glc retention time relative to 4 equaled 0·64–0·67; mol. wt. 420. Fractions 18–20 (80–85 per cent 8) were purified somewhat by recrystallization from isopropanol and were essentially identical (nmr, glc, m.p. 149·5–153·0°C, mixed m.p. 152–155°C) with a synthetic sample (m.p. 156·0–157·5°C).

Fractions 24–51 contained one major component (0·425 g, 15 per cent yield, glc retention time relative to 4 equaled 0·77–0·80) which was isolated as white needles (m.p. 124·5–126°C) by recrystallization of fractions 27–29 (80–85 per cent pure) from isopropanol. This compound was identified as 2,2'-diacetoxy-3,5',6,6'-tetrachlorodiphenylmethane (10) (mol. wt. 420) by comparison (i.r., nmr, glc, mixed m.p. 125–128°C) with a synthetic sample (m.p. 132–134°C).

The remaining 21 per cent of the photolysis mixture was a mixture of several other unidentified products including colored material.

Irradiation of 2,4,5-trichlorophenol (13). A solution of 3·00 g of 2,4,5-trichlorophenol (13) (Hooker Chemical Co., Buffalo, N.Y.) in 170 ml of absolute ethanol (0·0894 *M*) was irradiated for 6 hr using Corex-filtered light. Solvent was removed at reduced pressure and the residual black oil (2·92 g) was chromatographed on 300 g of silica gel, which was slurry packed with 5% acetic acid in hexane into a 3 × 66 cm column. The column was eluted with 5% acetic acid in hexane and 50 ml fractions were taken.

Fractions 14–16 contained 2,5-dichlorophenol (0·662 g, 27 per cent yield) which was identified on the basis of the following data: glc retention time relative to 13 equaled 0·34; tlc (silica gel developed with 5% acetic acid in hexane, run twice), R_f equaled 0·31; mol. wt. 162; ν_{max}^{neat} 1478 (s), 1085 (m), 1053 (m), 907 (m), 860 (m), 800 (m), 585 (m) cm^{-1}; nmr, 2·62 (1H, doublet, J = 8·5 Hz, H at C_3), 2·90 (1H, doublet, J = 2 Hz, H at C_6), 3·10 (1H, doublet of doublets, J = 8·5 Hz, J' = 2 Hz, H at C_4). This photoproduct was identical (i.r. and nmr spectra, glc, tlc) to authentic 2,5-dichlorophenol (Aldrich Chem. Co.).

Fractions 16–31 contained unreacted **13** (1·27 g, 42 per cent) which was identified by comparison of the nmr spectrum (two singlets at 2·44 and 2·76) to that of the starting material.

Fractions 45–58 contained 3,4-dichlorophenol (0·468 g, 19 per cent yield) which was identified on the basis of the following data: glc retention time relative to **13** equaled 1·5; tlc (silica gel developed with 5% acetic acid in hexane, run twice), R_f equaled 0·07; mol. wt. 162 ν_{max}^{neat} 1475(s), 1428(m), 1276(m), 1126(m), 903(m), 651(m) cm^{-1}; nmr, 2·65 (1H, doublet, J = 8·5 Hz, H at C_5), 2·92 (1H, doublet, J = 3 Hz, H at C_2), 3·14 (1H, doublet of doublets, J = 8·5 Hz, J′ = 3 Hz, H at C_6). This photoproduct was identical (i.r., nmr, glc, tlc) to authentic 3,4-dichlorophenol (Aldrich Chem. Co.).

Irradiation of **13** in absolute ethanol using Pyrex-filtered light paralleled the Corex irradiation, although the rate of reaction was slower.

Synthesis of 2,2′-Dihydroxy-3,3′,5,6,6′-pentachlorodiphenylmethane (**3**). A solution of 39·0 g (0·161 mole) of 4-bromo-2,5-dichlorophenol[1] and 36·0 g (0·158 mole) of 2-hydroxy-3,5,6-trichlorobenzyl alcohol[2] in 30 ml of methanol was added dropwise over 1 hr to a stirred solution of 550 ml of concentrated sulfuric acid with cooling such that the temp. remained less than 30°C. After addition, the mixture was stirred overnight at 30°C and at 35–40°C for 5 hr. The mixture was allowed to cool, quenched into 6 l of cold water, filtered, washed with water, and allowed to dry.

The orange crystals (78·0 g) were recrystallized from a toluene–hexane mixture to yield pure 2,2′-dihydroxy-5-bromo-3,6,3′,5′,6′-pentachlorodiphenylmethane as salmon-colored crystals, 41·1 g (58 per cent yield); m.p. 150·5–152·5°C; mol. wt. 448; nmr, 2·53 (1H, aromatic H), 2·69 (1H, aromatic H), 5·59 (2H, methylene H).

A solution of 300 g potassium hydroxide in 1900 ml of water was added to 75·0 g (0·166 mole) of the above bromide and the mixture was stirred for 10 min at 75–80°C to achieve solution. To the hot solution (75–85°C) was added 105 g of zinc dust over a period of 1 hr. After addition, the mixture was stirred at 80°C for 2·5 hr and then allowed to cool. The mixture was filtered and the zinc residue washed with 15% potassium hydroxide solution. Ice was added to the filtrate which was then acidified by the addition of concentrated hydrochloric acid. The precipitate was filtered, washed with water, and allowed to dry. The crude white crystals (60·8 g) were recrystallized twice from 4 to 5 : 1 hexane : toluene, removing by filtration the first formed flocculent precipitate, at −10°C to give 2,2′-dihydroxy-3,3′,5,6,6′-pentachlorodiphenylmethane (**3**) as white crystals, 34·0 g (55 per cent); m.p. 88–90°C; mol. wt. 370; ν_{max}^{KBr} 3400 (broad), 1442(s), 1185(m), 1140(m), 958(m) cm^{-1}; nmr, 2·62 (1H, aromatic H in pentasubstituted ring), 2·84 (1H, *d* of AB *q*, J = 8·5 Hz, aromatic H), 3·15 (1H, d of AB q, J = 8·5 Hz, aromatic H), 5·60 (2H, s, methylene H).

Anal. Calcd. for $C_{13}H_7Cl_5O_2$: C, 41·88; H, 1·88; Cl, 47·65. Found, C, 41·51; H, 1·82; Cl, 47·63.

One of several pilot experiments on this synthesis furnished a product whose spectral data was the same as that reported above except for the melting point (114–116°C).

Synthesis of 2,2′-Dihydroxy-3,5,5′,6,6′-pentachlorodiphenylmethane (**5**). From 54·0 g (0·223 mole) of 2-bromo-4,5-dichlorophenol[1] and 50·6 g (0·223 mole) of 2-hydroxy-3,5,6-trichlorobenzyl alcohol[2] there was obtained after recrystallization from aqueous methanol, 2,2′-dihydroxy-3-bromo-5,6,3′,5′,6′-pentachlorodiphenylmethane (38·5 g, 38 per cent); m.p. 162–166°C (anal. sample m.p. 167·0–168·5°C); mol. wt. 448; nmr, 2·43 (1H, s, aromatic H), 2·56 (1H, s, aromatic H), 5·53 (2H, s, methylene H).

Zinc reduction of the bromide (11·1 g, 0·025 mole) gave, after recrystallization from toluene, 2,2′-dihydroxy-3,5,5′,6,6′-pentachlorodiphenylmethane (5) as white granular crystals, 4·0 g (45 per cent), m.p. 196–199°C; mol. wt. 370; ν_{max}^{KBr} 3335 (broad), 1452(m), 1434(m), 1414(m), 961(s), 861(m), 810(m), 746(m) cm^{-1}; nmr, 2·50 (1H, s, aromatic H in pentasubstituted ring), 2·70 (1H, d of AB q, J = 9 Hz, aromatic H), 3·14 (1H, d of AB q, J = 9 Hz, aromatic H), 5·52 (2H, s, methylene H).

Anal. Calcd. for $C_{13}H_7Cl_5O_2$: C, 41·88; H, 1·88: Cl, 47·65. Found: C, 42·11; H, 2·10; Cl, 47·69.

Synthesis of 2,2′-Dihydroxy-3,5′,6,6′-tetrachlorodiphenylmethane (9). A solution of 1·50 g (0·0062 mole) of 4-bromo-2,5-dichlorophenol [1] and 1·69 g (0·0062 mole) of 2-hydroxy-3-bromo-5,6-dichlorobenzyl alcohol, prepared from 2-bromo-4,5-dichlorophenol [1] and formaldehyde according to the procedure in ref. [2], in 5 ml of methanol was added dropwise to a stirred solution of 55 g of conc. sulfuric acid. After addition, the mixture was stirred at room temp. 23 hr and at 30–40°C for 3 hr. The mixture was allowed to cool, quenched into 400 ml of cold water, filtered, washed with water, and allowed to dry.

The crude 2,2′-dihydroxy-3,5′-dibromo-3′,5,6,6′-tetrachlorodiphenylmethane (2·90 g) was not purified further; nmr, 2·51 (2H, s, aromatic H), 5·53 (2H, s, methylene H).

Zinc reduction of the dibromide (2·71 g), gave, after recrystallization from toluene using charcoal to decolorize, 2,2′-dihydroxy-3,5′,6,6′-tetrachlorodiphenylmethane (9) as white crystals, 0·60 g (29 per cent overall yield); m.p. 169–171°C; mol. wt. 336; ν_{max}^{KBr} 3370 (broad), 1452 (m), 1413(s), 959(s), 801(m) cm^{-1}; nmr, 2·75 and 3·06 (2H, AB q, J = 8·5 Hz, H at C_4 and C_5), 2·71 and 3·15 (2H, AB q, J = 8·5 Hz, H at $C_{3'}$ and $C_{4'}$), 5·56 (2H, s, methylene H).

Anal. Calcd. for $C_{13}H_8Cl_4O_2$: C, 46·15; H, 2·37; Cl, 42·01. Found: C, 45·90; H, 2·38; Cl, 41·63.

DISCUSSION

Irradiation of hexachlorophene (1),* followed by acetylation and chromatography, yielded 44 per cent starting material diacetate 2, 17 per cent 2,2′-diacetoxy-3,3′,5,6,6′-pentachlorodiphenylmethane (4) and 16 per cent 2,2′-diacetoxy-3,5,5′,6,6′-pentachlorodiphenylmethane (6) (see Fig. 1).† These structures were proven by independent syntheses via an unambiguous route (see Fig. 2).

The irradiation mixture also contained small amounts of diacetates which could not be isolated. Two of these, each in 2–3 per cent yield, were tentatively identified as 2,2′-diacetoxy-3,3′,6,6′-tetrachlorodiphenylmethane (8) and 2,2′-diacetoxy-3,5′,6,6′-tetrachlorodiphenylmethane (10) on the basis of identical glc retention times to those of synthetic samples (see Fig. 2). The other expected secondary photoproduct, 2,2′-diacetoxy-5,5′,6,6′-tetrachlorodiphenylmethane (12) could not be detected in the irradiation mixture.

*G-11® of Givaudan Corporation, Clifton, New Jersey.
†In all irradiations described there were additional unidentified products including colored material.

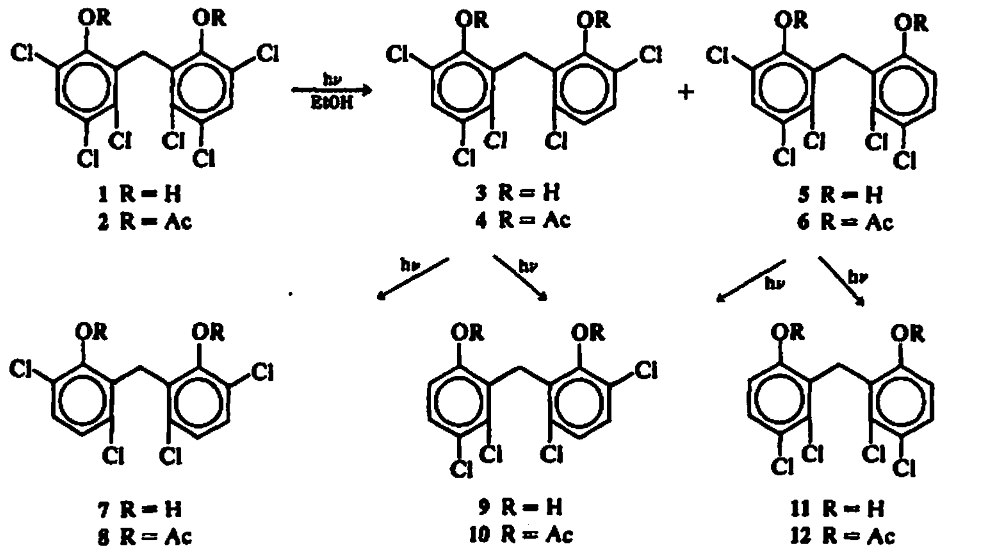

hν
EtOH
1 R = H
2 R = Ac
3 R = H
4 R = Ac
5 R = H
6 R = Ac
hν
7 R = H
8 R = Ac
9 R = H
10 R = Ac
11 R = H
12 R = Ac

Fig. 1

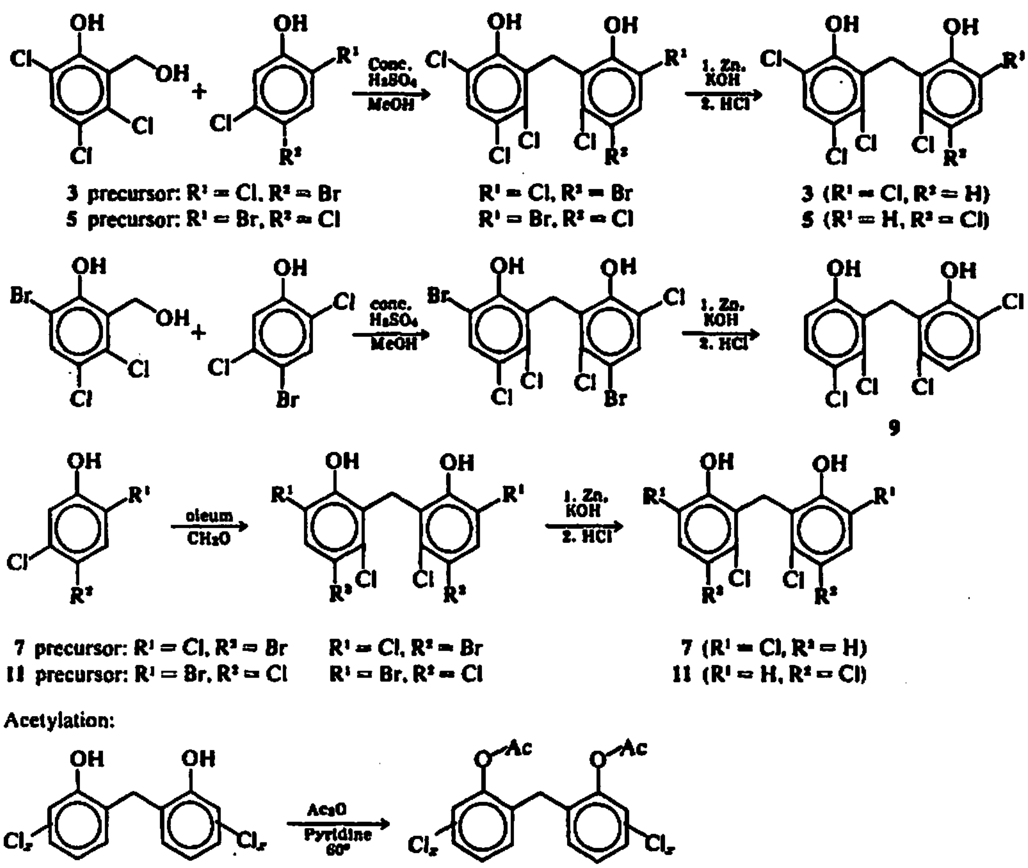
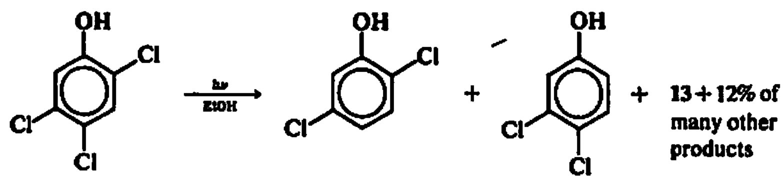

Conc. H_2SO_4
MeOH
1. Zn, KOH
2. HCl
3 precursor: R^1 = Cl, R^2 = Br
5 precursor: R^1 = Br, R^2 = Cl
R^1 = Cl, R^2 = Br
R^1 = Br, R^2 = Cl
3 (R^1 = Cl, R^2 = H)
5 (R^1 = H, R^2 = Cl)
9
oleum
CH_2O
7 precursor: R^1 = Cl, R^2 = Br
11 precursor: R^1 = Br, R^2 = Cl
R^1 = Cl, R^2 = Br
R^1 = Br, R^2 = Cl
7 (R^1 = Cl, R^2 = H)
11 (R^1 = H, R^2 = Cl)
Acetylation:
Ac_2O
Pyridine
60°

Fig. 2

The secondary photolysis reactions were substantiated by separate irradiations of both primary photoproducts **3** and **5**. Again separation was accomplished by chromatography of the diacetates. In both cases the two major reactions were the loss of a chlorine *ortho* or *para* to the hydroxyl group in the trichlorinated ring. Irradiation of **3** gave 46 per cent recovered starting material diacetate **4**, 18% **8**, 14% **10** and 21% other unidentified compounds. Irradiation of **5** gave 21 per cent recovered starting material diacetate **6**, 20% **10**, 26% **12** and 23% other unidentified compounds.

In each of the three cases studied, no major product was present where a chlorine *meta* to the hydroxyl group had been eliminated. A second observation was that the major products from both **3** and **5** resulted from chlorine elimination in the trichlorinated rather than the dichloroinated ring. Therefore, the quantum efficiency of photodechlorination must depend on both the position and number of halogen atoms.

To further investigate the *meta* chlorine fragmentation, a model compound, 2,4,5-trichlorophenol (**13**) was studied. In this case the irradiation mixture could be chromatographed directly as phenols using silica gel chromatography eluted with 5 per cent acetic acid in hexane. The results are summarized in equation (1).



13 27% 19% 42% (1)

Although two of the possible products, 2,5-dichlorophenol and 2,4-dichlorophenol were indistinguishable by tlc, the nmr spectra of the two were sufficiently characteristic to allow the photoproduct to be identified unambiguously as 2,5-dichlorophenol. Loss of *meta*-chlorine does not occur to any extent since the nmr spectrum showed no evidence for the presence of 2,4-dichlorophenol.

No work has been done to establish the mechanism of dechlorination but the reaction probably proceeds by homolytic cleavage followed by radical abstraction of hydrogen from the solvent to give dechlorinated phenol and hydrochloric acid. Pinhey and Rigby[3] have supporting evidence for this mechanism from their study of the photochemistry of *o*-, *m*-, and *p*-chlorophenol. They have isolated pinacol from irradiation in isopropanol which is usually considered as proof that radicals have abstracted hydrogen from solvent. A polar abstraction of a proton from an alcoholic solvent would involve the hydrogen attached to oxygen rather than the hydrogen attached to carbon.

These authors find[3] that photolysis of *m*-chlorophenol also yields a substantial amount of phenol. This is in contrast to the present observation that polychlorinated phenols and bisphenols show reluctance to *meta*-dechlorination.

Both primary photoproducts, **3** and **5** were submitted to a clinical investigation to ascertain their irritative and sensitizing potentialities on the human skin. In the concentration employed (2 per cent solutions by weight in dimethylphthalate), neither **3** nor **5** caused either any primary or sensitized irritative or allergenic reactions[4].

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3. J. T. Pinhey and R. D. G. Rigby, *Tetrahedron Lett.* 1267, 1271 (1969).
4. E. Edelson, private communication, May 25, 1970.

HB

Research Department
Givaudan Corporation
Clifton, New Jersey
Aug. 4, 1970

INVESTIGATIONS CONCERNING THE POSSIBLE PRESENCE OF 2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN IN GIVAUDAN's COMMERCIAL HEXACHLOROPHENE

2,3,7,8-Tetrachlorodibenzo-p-dioxin has recently been recognized as a very toxic substance. Some reports about its presence in certain 2,4,5-trichlorophenol - derived chemicals has induced Givaudan Corporation to investigate the question whether 2,3,7,8-tetrachlorodibenzo-p-dioxin might be contaminant of its commercial product, Hexachlorophene (G-11(R)).

The starting material for Hexachlorophene is 2,4,5-trichlorophenol. The latter is purchased by Givaudan Corporation exclusively from Hooker Chemical Corporation (Niagara Falls, N.Y.) who manufactures a specially purified grade of 2,4,5-trichlorophenol for Givaudan Corporation. This material has been carefully investigated by its manufacturer for possible presence as a contaminant of 2,3,7,8-tetrachlorodibenzo-p-dioxin. Hooker Chemical Corporation has given us a firm assurance that their 2,4,5-trichlorophenol, sold to Givaudan, did not contain any 2,3,7,8-tetrachlorodibenzo-p-dioxin down to a level of less than 0.1 ppm.

It is very unlikely that 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin might be formed during the manufacturing of Hexachlorophene. Nevertheless, it was considered imperative to investigate this question. This was done jointly by Hooker Chemical Corporation and Givaudan Corporation. Two detailed reports (enclosed) entitled "2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin Determination in Hexachlorophene" and "Extraction Efficiency in the Determination of 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin in Hexachlorophene" describe this work. In the samples of commercial Heachlorophene investigated, no 2, 3, 7, 8-tet rachlorodibenzo-p-dioxin could be detected (limit of sensitivity: 0.03 ppm).

Since non-phenolic impurities in Hexachlorophene, other than 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, might be highly toxic, the total of non-phenolic contaminants in commercial Hexachlorophene were submitted to a toxicological pilot study. Details are given in the attached report entitled "Determination of LD_{50} of Non-Phenolic Impurities in G-11". From this study it is evident that these impurities do not contain any highly toxic substance to any appreciable amount.

Finally, we were informed that workers handling chemicals containing 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin are often affected by a skin condition, called "Chloracne". Many of Givaudan's workers have been handling 2, 4, 5-trichlorophenol and Hexachlorophene for many years, but over the last 10 years, no case of "Chloracne" has ever developed.

A letter from Givaudan's plant dermatologist, Dr. E. Edelson, making a corresponding statement, is attached.

As a general conclution, we can safely state that we have no reason to believe that Givaudan's commercial Hexachlorophene (G-11) contains any 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin.

Encl. (4)

Hans U. Daeniker, Ph. D.
Vice-President of Research

August 5, 1970

2,3,7,8-Tetrachlorodibenzo-p-dioxin determination in Hexachlorophene

Introduction:

The present work is a joint project by Hooker Chemical Corp. (Niagara Falls, N.Y.) and Givaudan Corp. (Clifton, N.J.). The purpose was to determine quantitatively the possible presence of 2,3,7,8-tetrachlorodibenzo-p-dioxin as an impurity in Givaudan's commercial grade hexachlorophene.

Sample selection:

The present investigation included:

(a) 5 Samples from the following lots, chosen at random, produced in 1970, with the numbers:
8857-70; 8339-70; 8743-70; 8710-70; and 8666-70.

(b) 6 Samples, each being a bulk from 2 to 4 lots, chosen at random, manufactured during the second half of 1969, with the numbers: 18089 A, 18089 B, 18089 C, 18089 D, 18089 E, and 18089 F.

Extraction procedure:

2,3,7,8-Tetrachlorodibenzo-p-dioxin is a non-phenolic substance (in contrast to hexachlorophene) and - if present - could be separated from hexachlorophene itself due to this property. It was therefore decided to carry out the planned determination with the non-phenolic impurities present in commercial hexachlorophene. That this method is proper was proven by a separate study by Hooker Chemical Corp., see report dated July 31, 1970, entitled "Extraction Efficiency in the Determination of 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Hexachlorophene" (enclosed)

The non-phenolic impurities in the samples of commercial hexachlorophene were prepared as follows:

(a) 100 g. of G-11® were dissolved in 400 ml of H_2O containing 40 g. of NaOH by heating to 45-50°C. for 3-5 minutes and agitating overnight at room temperature.

(b) The alkaline G-11 solution was extracted with benzene 3 times using 200 ml of fresh benzene per extract.

(c) The combined benzene extracts were washed with 200 ml of 10% aqueous NaOH followed by 2 successive washings with 200 ml of water.

(d) The benzene solutions were concentrated on a rotary evaporator, to approximately 25 ml for shipment.

The 25 ml extracts were submitted to Hooker for analysis; it may be mentioned that they contained an average of 0.12 g material.

<u>Analytical procedure:</u>

(as carried out by Hooker Chemical Corp.)

At Hooker the extracts were concentrated to 0.5 ml, or as small a volume possible without precipitating solids.[1] Five µl of the concentrate were then analyzed by gas chromatography under the conditions listed on the following page.

---

(1) The ultimate sensitivity of the method is a function of volume to which the extract is concentrated.

CHROMATOGRAPHIC CONDITIONS

Column	2' glass packed with 2% Versamid 900 on 60-80 mesh Chromosorb DMCS.
Detector	Flame Ionization.
Hydrogen Flow	50 ml/min
Air Flow	200 ml/min
Helium Flow	50 ml/min
Injection Port temp.	260°C.
Detector Temperature	300°C.
Column Temperature	200°C.
Chart Speed	1/2"/min
Sample size	5 µl

A standard, containing 0.2µl/µl 2,3,7,8-tetrachlorodibenzo-p-dioxin in benzene, is injected and the chromatogram compared to that of the sample.

Results:

Sample	2,3,7,8 tetrachloro-dibenzo-p-dioxin	Sensitivity,[(1)] ppm
18089 A	ND*	.01
18089 B	ND	.01
18089 C	ND	.02
18089 D	ND	.01
18089 E	ND	.02
18089 F	ND	.02
885770	ND	.03
833970	ND	.02
874370	ND	.02
871070	ND	.02
866670	ND	.01

Conclusion:

In the samples of commercial hexachlorophene investigated, no 2,3,7,8-Tetrachlorodibenzo-p-dioxin could be detected.

It may be added that in the manufacture of hexachlorophene, Givaudan Corp. uses 2,4,5-trichlorophenol from Hooker Chemical Corp. exclusively. In similar investigations done by Hooker on this material no 2,3,7,8-tetrachlorodibenzo-p-dioxin could be detected, neither.

Daeniker

H. U. Daeniker, Ph.D.
Vice President of Research

:am
August 4, 1970

HOOKER CHEMICAL CORPORATION
NIAGARA FALLS, N. Y.
FORM 1074A

L E Tufts
Manager Quality Assurance

July 31, 1970

EXTRACTION EFFICIENCY IN THE DETERMINATION OF
2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN IN HEXACHLOROPHENE

An experiment was performed in the Works Laboratory to determine the efficiency of the procedure, devised by the Givaudan Corp., for the extraction of 2,3,7,8 tetrachlorodibenzo-p-dioxin from Hexachlorophene.

The procedure appears satisfactory.

Data:

2,3,7,8 tetrachlorodibenzo-p-dioxin Added, ppm	Recovered, ppm
0.05	0.035
0.10	0.10

Copies of the chromatograph scans are attached.

Experimental

All samples were prepared in the following manner:

1. 100 g of Hexachlorophene and an appropriate volume of a 0.211 $\mu g/\mu l$ dioxin in benzene standard were dissolved in 400 ml of water containing 40 g of NaOH by heating to 45 - 50°C for 3-5 minutes and agitating overnight at room temperature.

2. The alkaline Hexachlorophene solution was extracted with benzene 3 times using 200 ml of fresh benzene per extract.

3. The combined benzene extracts were washed with 200 ml of 10% aqueous NaOH followed by two successive washings with 200 ml of water.

4. The benzene extracts were concentrated to 0.5 ml., or as small a volume possible without forming undissolved solids. Five μl of this concentrate were then chromatographed under the conditions listed on the following page.

HOOKER CHEMICAL CORPORATION
NIAGARA FALLS, N. Y.
FORM 1078A

CHROMATOGRAPHIC CONDITIONS

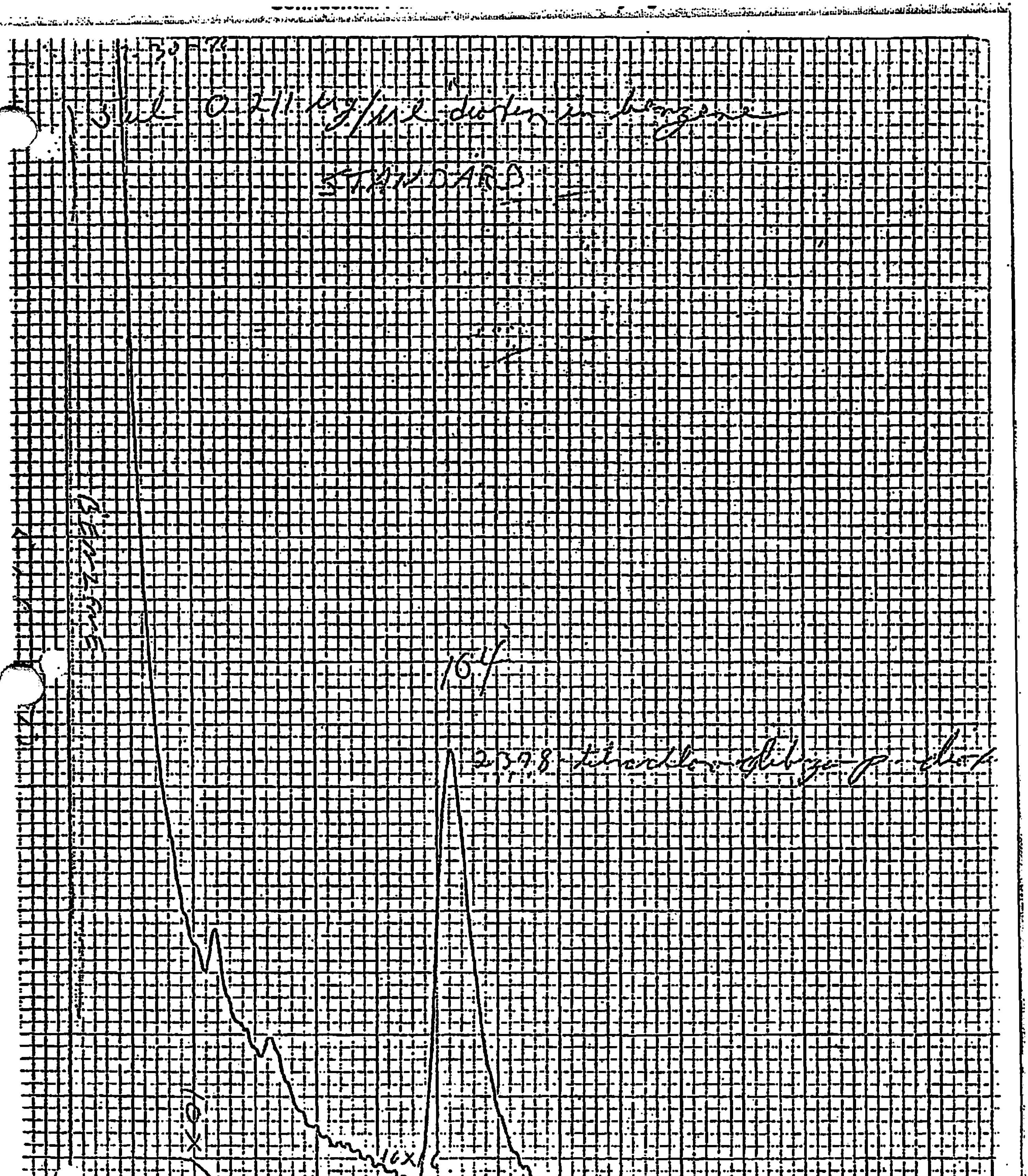
Column	2' glass packed with 2% Versamid 900 on 60-80 mesh chromosorb DMCS
Detector	Flame Ionization
Hydrogen Flow	50 ml/min
Air Flow	200 ml/min
Helium Flow	50 ml/min
Injection Port Temperature	260°C
Detector Temperature	300°C
Column Temperature	200°C
Chart Speed	½ per min
Sample Size	5 1

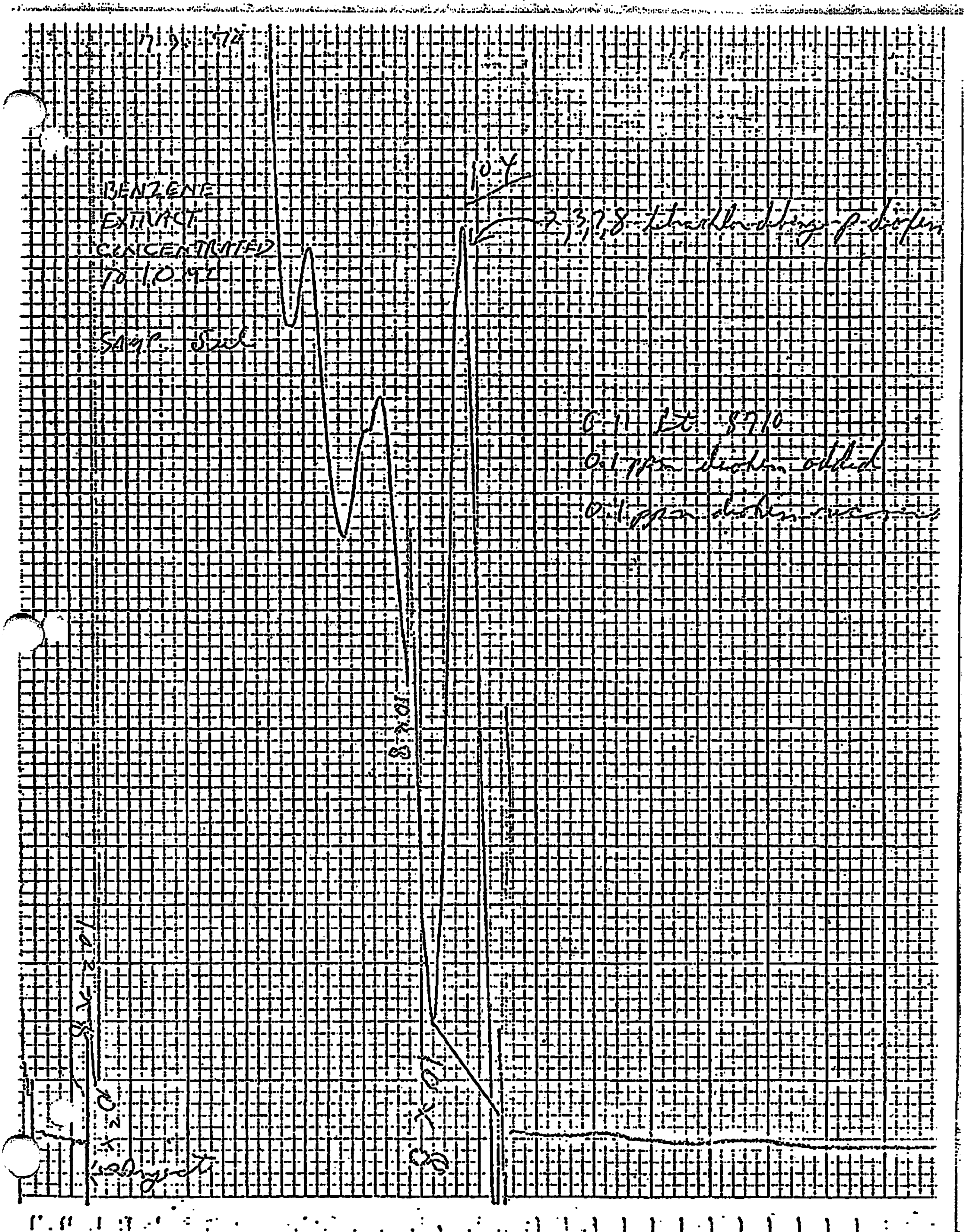
A standard, containing 0.2 μg/μl 2,3,7,8 tetrachlorodibenzo-p-dioxin in benzene, is injected and the chromatogram compared to that of the samples.

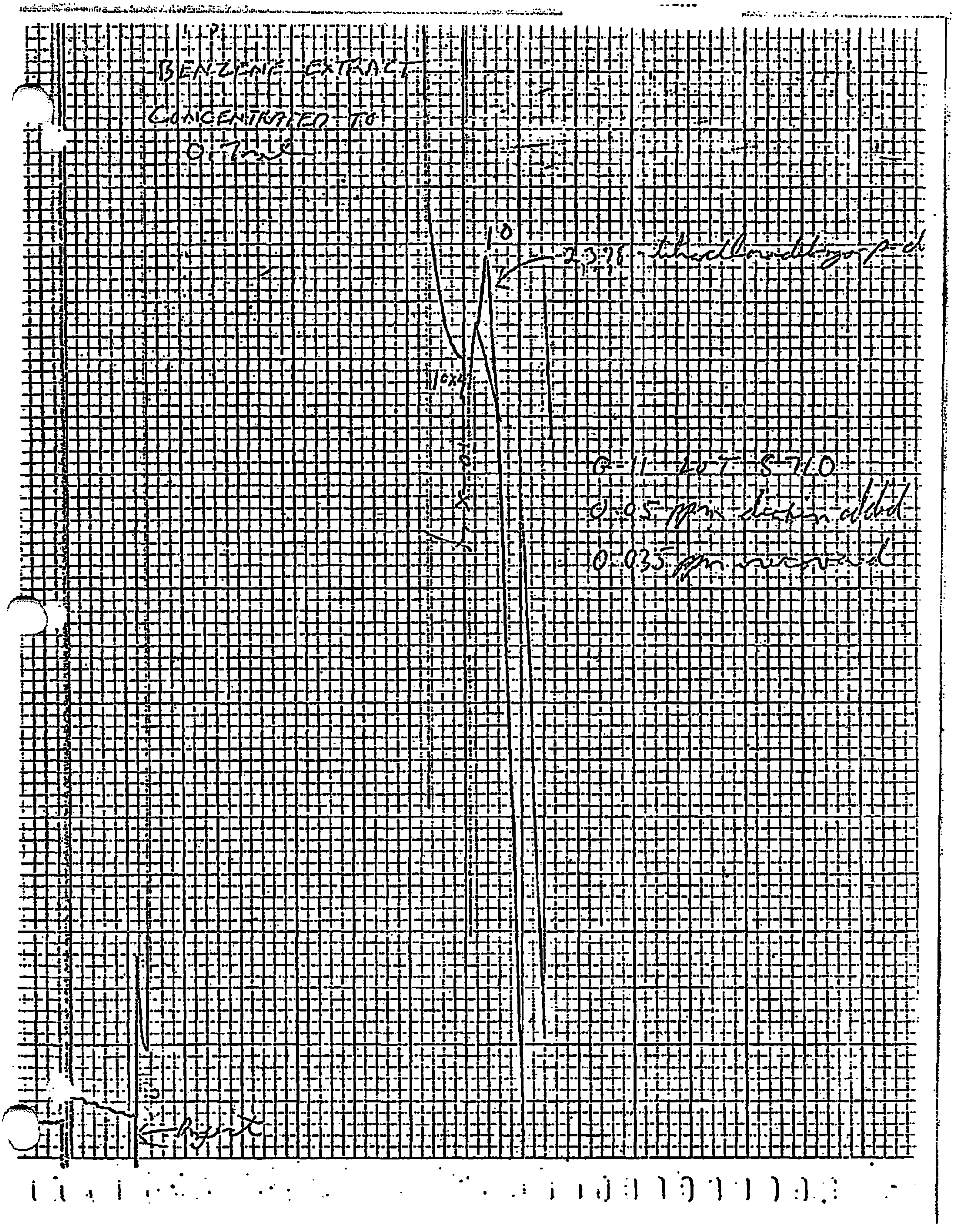
Gary Hahn

Gary Hahn
Chemist

lai


STANDARD
2378
10X


BENZENE
EXTRACT
CONCENTRATED
10.7
2,3,7,8-tetrachlorodibenzo-p-dioxin
0.1 ppm dioxin added
10.8
10 x 8


BENZENE EXTRACT
CONCENTRATED TO
0.7 ml
1.0
2,378
10x4
G-11 LOT S710
0.035 ppm recovered
Inject

DETERMINATION OF LD_{50} OF NON-PHENOLIC IMPURITIES IN G-11®

I. Extraction procedure

Ten 100 g. samples of G-11 were each subjected to the following extraction procedure:

a. 100 g. of G-11 were dissolved in 400 ml. water containing 40 g. sodium hydroxide by heating to 55-60°C for 3-5 minutes and agitating overnight at room temperature.

b. The alkaline G-11 solution was extracted 3 times using 200 ml. of fresh benzene per extract.

c. The combined benzene extracts were washed with 200 ml. of 10% aqueous sodium hydroxide followed by 2 successive washings with 200 ml. of water.

d. The benzene soln. was concentrated under reduced pressure to leave a waxy solid.

The total weight of non-phenolic impurities obtained in this manner from 1 kg. of G-11 was 1.1606 g. This material was dissolved in 10.45 g. of Mazzola Corn Oil, labelled as HB549 and sent to Leberco Laboratories in Roselle Park, N.J.

II. Determination of LD_{50}

A single feeding of the test material was given to CFE rats of the Carworth strain at four different levels - 50, 100, 200 and 500 mg. per kg. of body weight. The animals were then observed for five days for signs of toxicity. There were no deaths and no visible untoward effects were found.

Complete details of the test procedure and results are found in the attached report from Leberco.

III. Conclusion

The total non-phenolic impurities which are contained in Givaudan's commercial Hexachlorophene to an extent of app. 0.12% show a very low oral toxicity; in fact, lower than Hexachlorophene itself (on a weight per weight basis).

If any of the highly toxic 2,3,7,8-tetrachlorodibenzo-p-dioxin was present in our Hexachlorophene, it would be part of the "non-phenolic impurities". The present toxicological results show that 2,3,7,8-tetrachlorodibenzo-p-dioxin is not an impurity in Hexachlorophene to an extent of 0.1 ppm or more. (From analytical work we know, however, that the level of 2,3,7,8-tetrachlorodibenzo-p-dioxin is less than 0.03 ppm.)

The present toxicological investigation is but a pilot study. Work is underway to separate and identify the constituents of the non-phenolic impurities contained in commercial Hexachlorophene. Each major constituent will then be tested separately for toxicological properties.

H. A. Brandman

:gmp
Aug. 5, 1970

H. A. Brandman
Sr. Research Chemist
GIVAUDAN CORPORATION

LEBERCO LABORATORIES

123 HAWTHORNE STREET — ROSELLE PARK, N. J. 07204

DIAL 201 245 1933

July 20, 1970

SUBMITTED TO: Givaudan Corporation
Clifton, New Jersey

ASSAY NUMBER: 07912

DATE RECEIVED: July 10, 1970

TEST MATERIAL: 1 x 10 ml. sample cloudy amber liquid
(10% solution by weight in corn oil) #HB 549

SUBJECT OF ASSAY:

To determine the oral LD_{50}, in fasted rats, of the test material as submitted.

METHOD OF ASSAY:

Normal, healthy CFE rats of the Carworth strain, equally divided as to sex and weighing approximately 120 grams were used in this study. The animals were fasted for eighteen hours prior to dosing.

Several levels of the test material were administered orally, as is, to groups of rats. A rigid stomach tube was employed for the feedings.

Following the administration of each dose level the animals were observed for five days for signs of toxicity. Throughout the observation period the animals were housed in raised wire mesh cages and maintained on their regular diet of Lab Blox and water *ad libitum.*

RESULTS:

Ml. Fed per Kilogram of Rat	Number of Rats Fed	Dead
0.5	2	0
1.0	4	0
2.0	2	0
5.0	10	0

A single feeding of the test material to rats, at a dose level of 5.0 ml. per kilogram of rat, did not produce any visible untoward effects.

LEBERCO LABORATORIES

Anne M. Wolven, A. B.

Irving Levenstein, Ph. D.
Director

IL:sm

EDMOND EDELSON, M.D.
THE IRVINGTON PROFESSIONAL BUILDING
80 BALL STREET
IRVINGTON, N. J. 07111
ESsex 3-4545

July 2, 1970

Dr. Milton Manowitz
Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J.

Dear Dr. Manowitz:

This letter will supplement our discussion relative to Chloracne patients. After advising you that I could not recollect any Chloracne patients being treated from Givaudan, I went through my patient records including all of the dermatologic illnesses I had treated as your Company Dermatologic Consultant, for more than the past 10 years. I did not find one patient who had Chloracne either as his major or as a coincidental diagnosis among the Givaudan employees who were referred to me for the various dermatologic conditions.

Sincerely yours,

Edmond Edelson

Edmond Edelson, M. D.

EE:AR

INTER-OFFICE MEMO

GIVAUDAN

To: Mr. John Rankin

Date: June 22, 1983

From: Mr. Len Levy

Div: Q. C.

CC:

Subject: TCDD ANALYSIS IN HEXACHLOROPHENE

Dr. M. Monowitz

The Quality Assurance Laboratory began routinely analyzing G-11(R) (Hexachlorophene U.S.P.) in May 1977.

The normal procedure, is for the bulking of two lots of G-11 (5 g. each), extracting each of the pairs as per our procedure, and forwarding the extracts to California Analytical Laboratories for G.C.-M.S. Analysis.

The policy of the department is (since 1978), that if any analysis was above 1 ppb on the composite sample, each lot would be analyzed individually.

Review of the results since this laboratory began performing TCDD analysis, indicated that, prior to June 1978 the majority of samples analyzed were found to be less than 1.0 ppb with several samples (3-4) being below 4.0 ppb. In many instances, the higher TCDD levels were attributed to interferences in the G.C.- M.S. analysis which probably could be eliminated through reanalysis or additional sample clean-up. However, since the TCDD limit at that time was established at 10 ppb, these samples were not re-evaluated.

All samples evaluated after June 1978 were found to contain less than 1.0 ppb TCDD.

LAL:bj

Leonard Levy

GIVAUDAN CORPORATION 6/22/83

PRODUCTION AFFECTED BY RESTRICTIONS

PRODUCT	DAILY RATE	REASON SHUTDOWN
Bldgs. 58,59,60 G-11	2,200	Mfg. in Restricted Area
Bldg. 68 G-4 Tech	2,000	" " "
Bldg. 61 G-4 Pure	750	" " "
Bldg. 68 G-4-40 Tech	5,000	" " "
Bldg. 53		
Aldehyde C-9 FCC	225	" " "
Hexaldehyde	175	" " "
Aldehyde C-12 Lauric	200	" " "
Bldg. 56		
Citronellol Givco Extra Crude	1,800	" " "
Chemical A-6293 Crude	1,600	" " "
Ald. C-12 MNA Pure Crude	1,600	" " "
Lilial Crude	3,200	" " "
Butyl Benzyl Alcohol Crude	1,600	" " "
Dihydroanethole Crude	1,600	" " "
Gernaiol Pure M Crude	2,800	" " "
Bldg. 55		
Stabilizer 9A EI Crude	4,800	" " "
Bldg. 63		
Nobricol Crude	2,400	" " "
2-Methylene Undecanal Crude	1,000	" " "
	32,950	
Bldg 35C		
Lilial Crude	2,400	Filter press in restricted ar Bldg. 56
	35,350	Pounds Lost Daily

The 35,350 represents approximately 43% of our total average Daily production. In addition there are 3 key points to keeping the balance of production going.

(1) Being able to receive nitrogen. If we cannot the entire Production Department will have to shutdown for safety reasons.

(2) Being able to receive hydrogen. If we cannot an additional 25% of Production will be lost.

(3) Access to warehouses 51 and 78 for raw materials.

David Soltis
David Soltis
Production Control Manager

:bj

cc: A. Kessler
Management Committee

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF REGULATORY SERVICES
CN 402
TRENTON, N.J. 08625
609 - 292 - 2906

RECEIVED
JUL 14 1983
PITNEY, HARDIN, KIPP & SZUCH

MICHAEL F. CATANIA
DIRECTOR

HERBERT B. BENNETT
KEITH A. ONSDORFF
ASSISTANT DIRECTORS

July 12, 1983

Mr. William Hyatt
Pitney, Hardin, Kipp & Szuch
163 Madison Avenue
Morristown, NJ 07960

Dear Mr. Hyatt:

I am writing to confirm our telephone conversation of this morning concerning the movement of hexachlorophene from the Givaudan facility in Clifton, New Jersey. The prohibition on this movement contained in paragraph two of the Administrative Order dated June 17, 1983 is hereby revised as outlined below.

It is my understanding that Givaudan has conducted dioxin analysis on a substantial portion of the finished product hexachlorophene presently stored at the facility. This analysis, which was conducted by a laboratory certified by USEPA for dioxin analysis, has indicated no dioxin contamination of this product at the one part per billion detection level. Based upon these results, Givaudan is hereby authorized to move all hexachlorophene not located in buildings 52 through 65 for which the above dioxin analysis has been received. This authorization is, however, subject to any further requirement which the Food and Drug Administration may impose on the movement of this product.

As further analytical data becomes available and is transmitted to this Department concerning the remainder of the finished product hexachlorophene stored on site, the above procedure shall be utilized to determine whether that product be moved off site.

An additional condition for the movement of hexachlorophene from the Givaudan facility is that Givaudan must notify this Department and the Food and Drug Administration of the destination and purchaser of these shipments.

Please do not hestitate to contact me if you have any questions concerning the above.

Sincerely,

Michael F. Catania

Michael F. Catania

dm

cc: Commissioner Robert E. Hughey
Director Thomas Burke
Administrator Marwan Sadat
Dr. Bill Parkin, DOH
Len Fantasia, FDA

PITNEY, HARDIN, KIPP & SZUCH
163 MADISON AVENUE
CN 1945
MORRISTOWN, NEW JERSEY 07960

MORRISTOWN (201) 267-3333
NEW YORK (212) 926-0331

TELEX 642014
TELECOPIER (201) 267-3727

NEWARK OFFICE
33 WASHINGTON STREET
NEWARK, NEW JERSEY 07102

(201) 623-1980

WRITER'S DIRECT
DIAL NUMBER
(201) 631-4841

July 26, 1983

Mr. Michael F. Catania
Director
Department of Environmental Protection
Office of Regulatory Services
CN 402
Trenton, New Jersey 08625

RE: Givaudan Corporation

Dear Mr. Catania:

The purpose of this letter is to provide you with information we understand you will need to have before the Company commences manufacture of Hexachlorophene again.

Enclosed is an affidavit of Leonard A. Levy, dated July 22, 1983 describing the results of analysis of the Company's inventory of trichlorophenol for TCDD content. The Company proposes to use trichlorophenol from Lots 82145/12 and 82145/13 to recommence Hexachlorophene manufacture. As you will note from Mr. Levy's affidavit analysis of those lots showed less than 1 part per billion of TCDD.

In accordance with the requirements of the Department of Health, and after consulting with ERM, our consultants, Buildings 58, 59 and 60 have been completely vacuumed (including walls, floors, ceilings, rafters, equipment, etc.) using a high performance, industrial vacuum cleaner. Vacuum cleaner bags, together with all dust collected, have been retained. Additionally, the contents of Building 60, including floors, walls, ceilings and all equipment, have been solvent washed using Varsol #1, petroleum naptha made by Exxon Company of Houston, Texas. The floors of Buildings 58, 59 and 60 have been steamed and washed with an industrial detergent, Cesco 225, manufactured by Anpal Industries of Fort Lee, New Jersey. All residue from these washings has also been retained. The interior and contents, including all equipment of Building 60 have been painted. The floor of Building 60 has additionally been sealed. All waste materials, including vacuum cleaner bags and residue from the washings have been stored in Building 54, which remains a restricted area to be entered only with Level C protection.

Under separate cover we have responded to your letter request for information dated June 20, 1983.

The Company proposes to re-sample Buildings 58, 59 and 60 and we understand that pending receipt of analysis of those re-samplings, we are free to commence production of Hexachlorophene with Level C protection, less respirators. As in the past, the Hexachlorophene produced will be analyzed for TCDD content by California Testing Laboratories and no product will be shipped from the Company's facility unless it meets the specification of non-detectible at 1 part per billion.

We will advise you when Hexachlorophene production has been resumed.

Very truly yours,

William H. Hyatt, Jr.

bdp

bcc: Armin M. Kessler
Jon Christensen

AFFIDAVIT OF LEONARD A LEVY

VERIFYING THAT 2,4,5-TRICHLOROPHAENOL PRESENTLY HELD IN STOCK FOR THE PREPARATION OF HEXACHLOROPHAENE HAS BEEN ANALYSED FOR TCDD AND NONE WAS FOUND AT A DETECTION LEVEL OF ONE PART PER BILLION

STATE OF NEW JERSEY
CITY OF CLIFTON
COUNTY OF PASSAIC

Leonard A. Levy, being duly sworn, deposes and says:

1. He has been the Manager of Quality Assurance since October 1, 1975 to the present time and during that period has been responsible for the department that analyzes all raw materials received by and all finished products shipped by the Givaudan Corp. plant located at 125 Delawanna Avenue in Clifton, New Jersey.

2. As of this date, the amount of 2,4,5-Trichlorophenol (TCP) presently on site, all of which is to be converted to hexachlorophene, totals about 32,500 lbs. (17,933 kg) and is from four different lots shipped by the manufacturer (Celamerck) and identified by them as

Lot # 82145/12
Lot # 82145/13
Lot # 82145/14
Lot # 82145/15

3. Each of these lots was submitted for analysis for 2,3,7,8-TCDD according to our normal procedure which is as follows:

a) A sample is taken from each lot of TCP received from the manufacturer.

b) Five grams from each of two lots is combined and a composite sample is prepared for analysis.

(Samples from each batch are retained at least until the analysis is received. It is our policy that should the composite show the presence of TCDD at the one part per billion level or greater, then each individual lot would be analyzed.)

c) The sample is prepared according to the same procedure used for hexachlorophene, primarily to remove phenolic material, and sent to California Analytical Laboratories, Inc. for analysis. (The procedure used to prepare and test the samples is the one described in the U.S. Pharmacopia for hexachlorophene.)

4. The result for the 10 g composite sample representing Lots 82145/12 and 82145/13 was received on June 16, 1983 and shows less than one part per billion TCDD.

5. The results for a 10 g composite sample representing Lots 82145/14 and 82145/15 have not, as yet, been received from California Analytical Laboratories, Inc.

Leonard A. Levy
July 22, 1983

Before me this 22 day of July, 1983, personally appeared Leonard A. Levy, who, being duly sworn, deposed and stated that the statements made in the foregoing affidavit are true to the best of his knowledge and belief, except as to matters stated to be upon information and belief, and as to these, affiant stated that he believes them to be true.

Catherine Jeszenszky
Notary Public

CATHERINE JESZENSZKY
Notary Public, State of New Jersey
My Commission Expires Dec. 3, 1984

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Telephone: (201) 645-2695

Food & Drug Administration
20 Evergreen Place
East Orange, New Jersey 070

RECEIVED
AUG 2 - 1983
PITNEY, HARDIN, KIPP & SZUCH

AMK
W. Wyatt

July 29, 1983

Dr. Milton Manowitz
Director of Research and Development
Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Dear Dr. Manowitz:

This is to confirm our July 25, 1983 telephone conversation with Mr. John Christiansen of your firm. We have advised Mr. Christiansen that analysis of the hexachlorophene samples collected by the Food and Drug Administration had been completed. Analysis revealed that all five samples analyzed for dioxin met the USP specifications.

Based on the analytical results, the Food and Drug Administration contemplates no further action as regards the hexachlorophene product stored at Givaudan.

Please feel free to contact us if we can be of further assistance.

Very truly yours,

LEONARD D. FANTASIA
Director, Compliance Branch
Newark District Office

DK:bhs

cc: Michael Catania, Director
Dept. of Environmental Protection

[redacted]

RECEIVED at RESEARCH
AUG - 1983

(3)

G11 Operator Duties

I. Reactor Operator Duties

Direct Duties

1. Charge Reactor
   A. EDC via meter
   B. TCP from containers to melt tank to reactor
   C. Oleum 20% via weigh tank
2. Charge reactor feed hopper with preweighed PFA
3. Reaction!
   A Feed PFA to reaction, control temperatur
   B Reflux reaction mass
   C Pump fininshed batch to 1st Settler (Settling vessel) containing EDC extracts.
4. Separate off spent acid layer via pump to 2nd Settler (Extractor)
5. Pump batch to Treatment Tank (De-colorizer)
6. Extract spent acid layer with Fresh EDC (3x). Pump extracts to 1st Settler or storage tank
7. Pump extracted acid layer to solvent recovery still, and distill off EDC solvent under vacuum.
8. Pump solvent free spent acid to sewer or storage tank for reprocessing.

Miscellaneous Duties

1. Charge EDC to storage from drums.
2. Gauge EDC storage tanks
3. Wash out pumps, tanks and vessels for repairs when needed
4. Open process lines to free plugged transfer lines

ir

II Sparkler Filter Operator / Steam Stills Direct Duties

1. Charge Treatment Tank (Decolorizer) batch -
   A. Filtrol (Bentonite clay) from bags via hopper
   B. Super cel (Diatomaceous Earth) via hopper
   C. G11 rework (HCP) via hopper.
   D. As required Asbestos/cement fiber via hopper
2. Reflux batch to decolorize and remove water
3. Precoat sparkler filter with super cel
4 suspended in EDC
4. Filter batch to solution holding tank (feed tank).
5. Wash filter with EDC
6. Vacuum dry filter
7. Remove sparkler filter cartridge
8. Clean filter
9. Replace clean filter cartridge
10. Disassemble sparkler cartridge clean of spent filtrol, reassemble.
11. Containerize spent filtrol for disposal.
12. Feed filtered batch to steam still and steam strip off EDC and TCP.

Sparkler Filter Operator

13. Remove, clean and replace polishing filter bag.
14. Pump GII slurry to holding tank in filter press area.

III Filterpress / Dryer Operator

1. Full, drop, clean and reassemble filter presses.
2. Load dryer with wetcake.
3. Run dryer
4. Unload dryer into powder carts for grinding.
5. Cut and replace defective filter cloths.
6. Clean out filterpress room trenches of spilled product
7. Filter and dry GU rework.

IV Grinding / packaging out

1. Shovel dried powder into grinder
2. Package ground powder, stencil and palletized finished product.

Certified Mail 7/1/

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

July 1, 1983

Marilyn Fingerhut, PhD.
NIOSH
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati, Ohio 45226

Dear Dr. Fingerhut:

In reference to your letter of March 23 and our subsequent discussions enclosed are the following reports, letters, memos, etc., concerned with analyses of the hexachlorophene process for the presence of 2,3,7,8-tetrachlorodibenzo-p-dioxin.

I Letter of August 18, 1970 from H.U. Daeniker to Director of Bureau of Drugs, FDA with the following attachments:

✓ 1. Investigations concerning the possible presence of 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Givaudan's commercial Hexachlorophene; H.U. Daeniker, August 5, 1970.

✓ 2. 2,3,7,8-Tetrachlorodibenzo-p-dioxin determination in Hexachlorophene; H.U. Daeniker, August 4, 1970.

✓ 3. Extraction Efficiency in the determination of 2,3,7,8-tetrachlorodibenzo-p-dioxin in Hexachlorophene; G. Hahn, July 31, 1970. (Hooker Chemical Company).

✓ 4. Determination of LD_{50} of non-phenolic impurities in G-11®; H.A. Brandman, August 5, 1970.

a. Leberco Laboratories; July 20, 1970.

✓ 5. Letter of July 2, 1970 from E. Edelson to M. Manowitz.

II Certificates of Analysis for 2,4,5-Trichlorophenol, purified, purchased from Dow Chemical during the period October, 1976 - December, 1978.

III ✓ 1. Letter of November 22, 1976 from M.V. Polito to F.G. Eichel with attachment:

✓ a. Memorandum of November 10, 1976 from W.M. Upholt to M.V. Polito.

2. Trichlorophenol (Report on Visit by EPA Officers. August 20, 1976); F.G. Eichel; August 20, 1976.

IV. 1. Letter of November 14, 1977 from P. Doucette to R. Goldman and W. Monastyrski with following attachments:

   a. Quality Control Department, TCDD Analysis, Old Procedure; January, 1977.

   b. Quality Control Department, TCDD Analysis, Revised Procedure; November 7, 1977.

   c. IOM from H. Brandman to S. Gold; TCDD/G-11 Analysis; May 31, 1977.

   d. IOM from H. Brandman to S. Gold; TCDD/G-11 Analysis; September 8, 1977.

2. IOM from L. Levy to J. Rankin; TCDD Analysis in Hexachlorophene; June 22, 1983.

V. Analysis Results of Sanitary Sewer Discharge as Required by your NJPDES/SUI Permits. CFM Incorporated to Givaudan Corporation, January 13, 1983.

VI. Certificates of Analysis for 2,4,5-Trichlorophenol, pure, during the period August, 1978 - March, 1983.

VII. Sampling Procedure for TCDD in G-11 Area; A. Stofa, June 18, 1981 with attachments: (OSHA inspection).

1. Contracted sample report.

2. Sampling data.

VIII. 1. 2,4,5-Trichlorophenol, Analysis for TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin), Analysis Performed by Quality Assurance; April 19, 1983. Revised June 24, 1983.

2. 2,4,5-Trichlorophenol Analysis for TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin), Analysis (Extractions) Performed by Research Labs; April 19, 1983.

IX. Report of May 11, 1983 from California Analytical Laboratories, Inc. (A.S. Wong) to Givaudan Corporation.

X Letter of May 25, 1983 from G.F. Talarico to E. Stevenson with attachments:

1. New Jersey Department of Environmental Protection Selected Substance Report.

2. Diagram of Hexachlorophene Process: V. Iappelli, May 4, 1983.

XI Source of Supply of Pure 2,4,5-Trichlorophenol to Givaudan Corporation, M. Manowitz, June 27, 1983.

We are continuing our search of the various departmental files for any additional documents that are relevant to this matter.

Sincerely,

GIVAUDAN CORPORATION

M. Manowitz. PhD.
Director - R & D

MM/dj
Enclosures

bcc: Mr. Rankin
Mr. Kessler
Mr. Turetsky
Dr. Tavares (Encl.)

HB

Research Department
Givaudan Corporation
Clifton, New Jersey
Aug. 4, 1970

INVESTIGATIONS CONCERNING THE POSSIBLE PRESENCE OF 2, 3, 7, 8-TETRACHLORODIBENZO-p-DIOXIN IN GIVAUDAN's COMMERCIAL HEXACHLOROPHENE

2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin has recently been recognized as a very toxic substance. Some reports about its presence in certain 2, 4, 5-trichlorophenol - derived chemicals has induced Givaudan Corporation to investigate the question whether 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin might be contaminant of its commercial product, Hexachlorophene (G-11(R)).

The starting material for Hexachlorophene is 2, 4, 5-trichlorophenol. The latter is purchased by Givaudan Corporation exclusively from Hooker Chemical Corporation (Niagara Falls, N. Y.) who manufactures a specially purified grade of 2, 4, 5-trichlorophenol for Givaudan Corporation. This material has been carefully investigated by its manufacturer for possible presence as a contaminant of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin. Hooker Chemical Corporation has given us a firm assurance that their 2, 4, 5-trichlorophenol, sold to Givaudan, did not contain any 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin down to a level of less than 0. 1 ppm.

It is very unlikely that 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin might be formed during the manufacturing of Hexachlorophene. Nevertheless, it was considered imperative to investigate this question. This was done jointly by Hooker Chemical Corporation and Givaudan Corporation. Two detailed reports (enclosed) entitled "2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin Determination in Hexachlorophene" and "Extraction Efficiency in the Determination of 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin in Hexachlorophene" describe this work. In the samples of commercial Heachlorophene investigated, no 2, 3, 7, 8-tet rachlorodibenzo-p-dioxin could be detected (limit of sensitivity: 0. 03 ppm).

Since non-phenolic impurities in Hexachlorophene, other than 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, might be highly toxic, the total of non-phenolic contaminants in commercial Hexachlorophene were submitted to a toxicological pilot study. Details are given in the attached report entitled "Determination of LD_{50} of Non-Phenolic Impurities in G-11". From this study it is evident that these impurities do not contain any highly toxic substance to any appreciable amount.

Finally, we were informed that workers handling chemicals containing 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin are often affected by a skin condition, called "Chloracne". Many of Givaudan's workers have been handling 2, 4, 5-trichlorophenol and Hexachlorophene for many years, but over the last 10 years, no case of "Chloracne" has ever developed.

A letter from Givaudan's plant dermatologist, Dr. E. Edelson, making a corresponding statement, is attached.

As a general conclution, we can safely state that we have no reason to believe that Givaudan's commercial Hexachlorophene (G-11) contains any 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin.

Encl. (4)

Daenikr

Hans U. Daeniker, Ph. D.
Vice-President of Research

August 5, 1970

2,3,7,8-Tetrachlorodibenzo-p-dioxin determination in Hexachlorophene

Introduction:

The present work is a joint project by Hooker Chemical Corp. (Niagara Falls, N.Y.) and Givaudan Corp. (Clifton, N.J.). The purpose was to determine quantitatively the possible presence of 2,3,7,8-tetrachlorodibenzo-p-dioxin as an impurity in Givaudan's commercial grade hexachlorophene.

Sample selection:

The present investigation included:

(a) 5 Samples from the following lots, chosen at random, produced in 1970, with the numbers:
8857-70; 8339-70; 8743-70; 8710-70; and 8666-70.

(b) 6 Samples, each being a bulk from 2 to 4 lots, chosen at random, manufactured during the second half of 1969, with the numbers: 18089 A, 18089 B, 18089 C, 18089 D, 18089 E, and 18089 F.

Extraction procedure:

2,3,7,8-Tetrachlorodibenzo-p-dioxin is a non-phenolic substance (in contrast to hexachlorophene) and - if present - could be separated from hexachlorophene itself due to this property. It was therefore decided to carry out the planned determination with the non-phenolic impurities present in commercial hexachlorophene. That this method is proper was proven by a separate study by Hooker Chemical Corp., see report dated July 31, 1970, entitled "Extraction Efficiency in the Determination of 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Hexachlorophene" (enclosed)

The non-phenolic impurities in the samples of commercial hexachlorophene were prepared as follows:

(a) 100 g. of G-11® were dissolved in 400 ml of H_2O containing 40 g. of NaOH by heating to 45-50°C. for 3-5 minutes and agitating overnight at room temperature.

(b) The alkaline G-11 solution was extracted with benzene 3 times using 200 ml of fresh benzene per extract.

(c) The combined benzene extracts were washed with 200 ml of 10% aqueous NaOH followed by 2 successive washings with 200 ml of water.

(d) The benzene solutions were concentrated on a rotary evaporator, to approximately 25 ml for shipment. The 25 ml extracts were submitted to Hooker for analysis; it may be mentioned that they contained an average of 0.12 g material.

Analytical procedure:

(as carried out by Hooker Chemical Corp.)

At Hooker the extracts were concentrated to 0.5 ml, or as small a volume possible without precipitating solids.[1] Five µl of the concentrate were then analyzed by gas chromatography under the conditions listed on the following page.

(1) The ultimate sensitivity of the method is a function of volume to which the extract is concentrated.

CHROMATOGRAPHIC CONDITIONS

Column	2' glass packed with 2% Versamid 900 on 60-80 mesh Chromosorb DMCS.
Detector	Flame Ionization.
Hydrogen Flow	50 ml/min
Air Flow	200 ml/min
Helium Flow	50 ml/min
Injection Port temp.	260°C.
Detector Temperature	300°C.
Column Temperature	200°C.
Chart Speed	1/2"/min
Sample size	5 µl

A standard, containing 0.2µl/µl 2,3,7,8-tetra-chlorodibenzo-p-dioxin in benzene, is injected and the chromatogram compared to that of the sample.

Results:

Sample	2,3,7,8 tetrachloro-dibenzo-p-dioxin	Sensitivity,(1) ppm
18089 A	ND*	.01
18089 B	ND	.01
18089 C	ND	.02
18089 D	ND	.01
18089 E	ND	.02
18089 F	ND	.02
885770	ND	.03
833970	ND	.02
874370	ND	.02
871070	ND	.02
866670	ND	.01

<u>Conclusion:</u>

In the samples of commercial hexachlorophene investigated, no 2,3,7,8-Tetrachlorodibenzo-p-dioxin could be detected.

It may be added that in the manufacture of hexachlorophene, Givaudan Corp. uses 2,4,5-trichlorophenol from Hooker Chemical Corp. exclusively. In similar investigations done by Hooker on this material no 2,3,7,8-tetrachlorodibenzo-p-dioxin could be detected, neither.

Daeniker

H. U. Daeniker, Ph.D.
Vice President of Research

:am
August 4, 1970

HOOKER CHEMICAL CORPORATION
NIAGARA FALLS, N. Y.
FORM 2074A

L E Tufts
Manager Quality Assurance

July 31, 1970

EXTRACTION EFFICIENCY IN THE DETERMINATION OF
2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN IN HEXACHLOROPHENE

An experiment was performed in the Works Laboratory to determine the efficiency of the procedure, devised by the Givaudan Corp., for the extraction of 2,3,7,8 tetrachlorodibenzo-p-dioxin from Hexachlorophene.

The procedure appears satisfactory.

Data:

2,3,7,8 tetrachlorodibenzo-p-dioxin Added, ppm	Recovered, ppm
0.05	0.035
0.10	0.10

Copies of the chromatograph scans are attached.

Experimental

All samples were prepared in the following manner:

1. 100 g of Hexachlorophene and an appropriate volume of a 0.211 $\mu g/\mu l$ dioxin in benzene standard were dissolved in 400 ml of water containing 40 g of NaOH by heating to 45 - 50°C for 3-5 minutes and agitating overnight at room temperature.

2. The alkaline Hexachlorophene solution was extracted with benzene 3 times using 200 ml of fresh benzene per extract.

3. The combined benzene extracts were washed with 200 ml of 10% aqueous NaOH followed by two successive washings with 200 ml of water.

4. The benzene extracts were concentrated to 0.5 ml., or as small a volume possible without forming undissolved solids. Five μl of this concentrate were then chromatographed under the conditions listed on the following page.

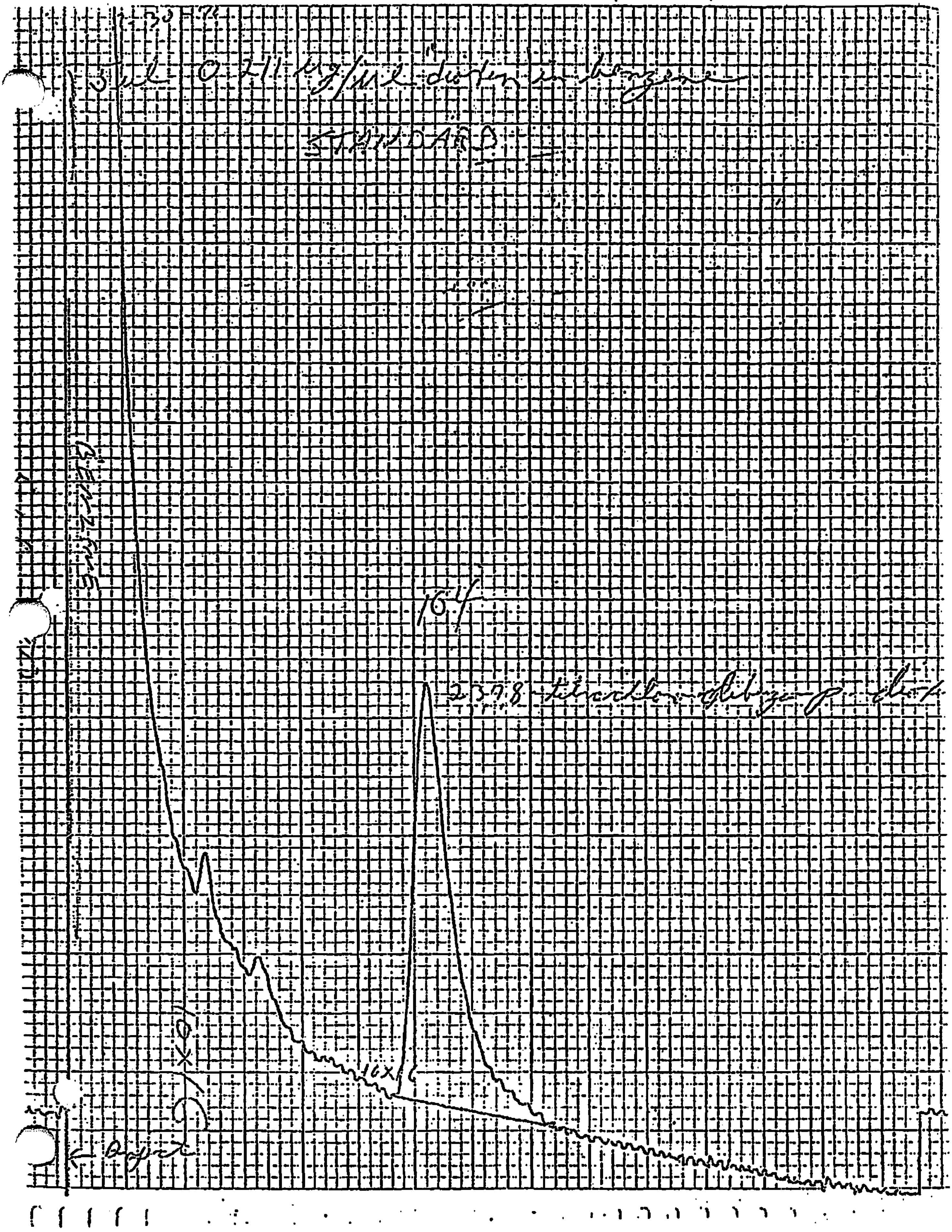
CHROMATOGRAPHIC CONDITIONS

Column	2' glass packed with 2% Versamid 900 on 60-80 mesh chromosorb DMCS
Detector	Flame Ionization
Hydrogen Flow	50 ml/min
Air Flow	200 ml/min
Helium Flow	50 ml/min
Injection Port Temperature	260°C
Detector Temperature	300°C
Column Temperature	200°C
Chart Speed	½ per min
Sample Size	5 1

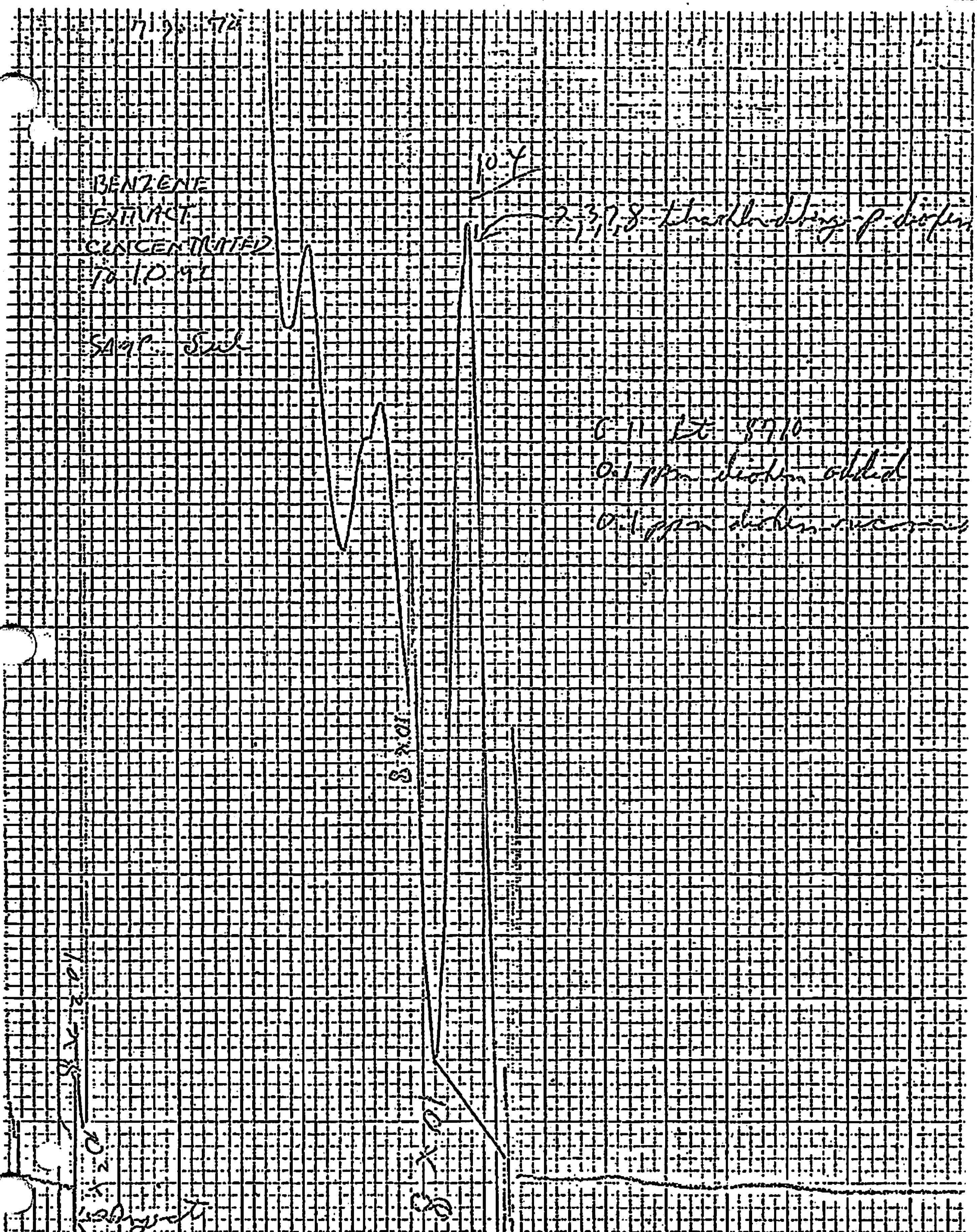
A standard, containing 0.2 μg/μl 2,3,7,8 tetrachlorodibenzo-p-dioxin in benzene, is injected and the chromatogram compared to that of the samples.

Gary Hahn
Gary Hahn
Chemist

lai

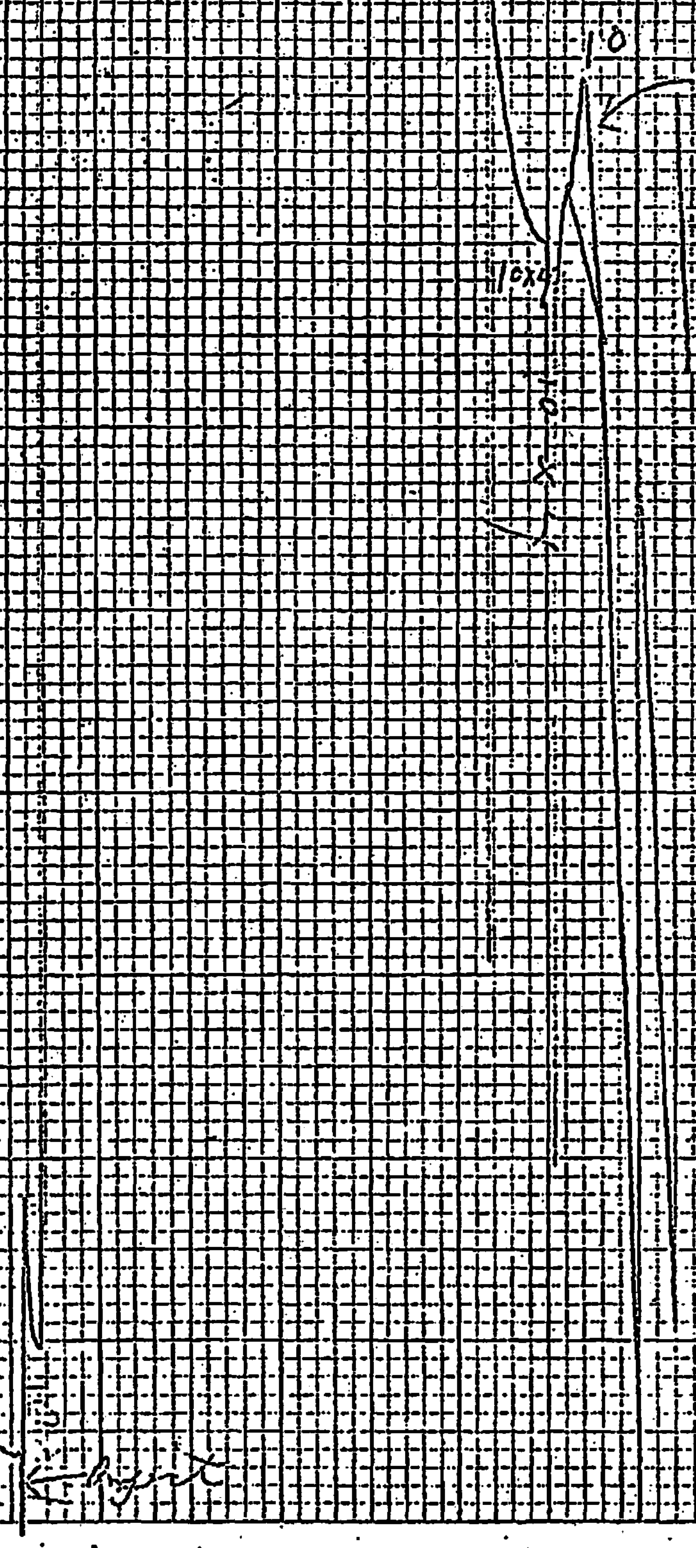


7-30-72
5 μl 0.21 ng/μl dioxin in benzene
STANDARD
164
2378 tetrachloro dibenzo-p dioxin
BENZENE
10X
16X



BENZENE
EXTRACT
CONCENTRATED
SAMP. Soil
2,3,7,8-
10 x 8
10² x 8

BENZENE EXTRACT
CONCENTRATED TO
0.7 ml



2,3,7,8 - tetrachlorodibenzo-p-d

G-11 LOT 8710
0.05 ppm dioxin added
0.035 ppm recovered

DETERMINATION OF LD_{50} OF NON-PHENOLIC IMPURITIES IN G-11®

1. Extraction procedure

Ten 100 g. samples of G-11 were each subjected to the following extraction procedure:

a. 100 g. of G-11 were dissolved in 400 ml. water containing 40 g. sodium hydroxide by heating to 55-60°C for 3-5 minutes and agitating overnight at room temperature.

b. The alkaline G-11 solution was extracted 3 times using 200 ml. of fresh benzene per extract.

c. The combined benzene extracts were washed with 200 ml. of 10% aqueous sodium hydroxide followed by 2 successive washings with 200 ml. of water.

d. The benzene soln. was concentrated under reduced pressure to leave a waxy solid.

The total weight of non-phenolic impurities obtained in this manner from 1 kg. of G-11 was 1.1606 g. This material was dissolved in 10.45 g. of Mazzola Corn Oil, labelled as HB549 and sent to Leberco Laboratories in Roselle Park, N.J.

II. Determination of LD_{50}

A single feeding of the test material was given to CFE rats of the Carworth strain at four different levels - 50, 100, 200 and 500 mg. per kg. of body weight. The animals were then observed for five days for signs of toxicity. There were no deaths and no visible untoward effects were found.

Complete details of the test procedure and results are found in the attached report from Leberco.

III. Conclusion

The total non-phenolic impurities which are contained in Givaudan's commercial Hexachlorophene to an extent of app. 0.12% show a very low oral toxicity; in fact, lower than Hexachlorophene itself (on a weight per weight basis).

If any of the highly toxic 2,3,7,8-tetrachlorodibenzo-p-dioxin was present in our Hexachlorophene, it would be part of the "non-phenolic impurities". The present toxicological results show that 2,3,7,8-tetrachlorodibenzo-p-dioxin is not an impurity in Hexachlorophene to an extent of 0.1 ppm or more. (From analytical work we know, however, that the level of 2,3,7,8-tetrachlorodibenzo-p-dioxin is less than 0.03 ppm.)

The present toxicological investigation is but a pilot study. Work is underway to separate and identify the constituents of the non-phenolic impurities contained in commercial Hexachlorophene. Each major constituent will then be tested separately for toxicological properties.

H. A. Brandman

:gmp
Aug. 5, 1970

H. A. Brandman
Sr. Research Chemist
GIVAUDAN CORPORATION

LEBERCO LABORATORIES

123 HAWTHORNE STREET — ROSELLE PARK, N. J. 07204

DIAL 201 245 1933

July 20, 1970

SUBMITTED TO: Givaudan Corporation
Clifton, New Jersey

ASSAY NUMBER: 07912

DATE RECEIVED: July 10, 1970

TEST MATERIAL: 1 x 10 ml. sample cloudy amber liquid (10% solution by weight in corn oil) #HB 549

SUBJECT OF ASSAY:

To determine the oral LD_{50}, in fasted rats, of the test material as submitted.

METHOD OF ASSAY:

Normal, healthy CFE rats of the Carworth strain, equally divided as to sex and weighing approximately 120 grams were used in this study. The animals were fasted for eighteen hours prior to dosing.

Several levels of the test material were administered orally, as is, to groups of rats. A rigid stomach tube was employed for the feedings.

Following the administration of each dose level the animals were observed for five days for signs of toxicity. Throughout the observation period the animals were housed in raised wire mesh cages and maintained on their regular diet of Lab Blox and water ad libitum.

RESULTS:

Ml. Fed per Kilogram of Rat	Number of Rats Fed	Dead
0.5	2	0
1.0	4	0
2.0	2	0
5.0	10	0

A single feeding of the test material to rats, at a dose level of 5.0 ml. per kilogram of rat, did not produce any visible untoward effects.

LEBERCO LABORATORIES

Anne M. Wolven, A. B.

Irving Levenstein, Ph. D.
Director

IL:sm

EDMOND EDELSON, M.D.
THE IRVINGTON PROFESSIONAL BUILDING
50 BALL STREET
IRVINGTON, N. J. 07111

ESSEX 3-4545

July 2, 1970

Dr. Milton Manowitz
Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J.

Dear Dr. Manowitz:

This letter will supplement our discussion relative to Chloracne patients. After advising you that I could not recollect any Chloracne patients being treated from Givaudan, I went through my patient records including all of the dermatologic illnesses I had treated as your Company Dermatologic Consultant, for more than the past 10 years. I did not find one patient who had Chloracne either as his major or as a coincidental diagnosis among the Givaudan employees who were referred to me for the various dermatologic conditions.

Sincerely yours,

Edmond Edelson

Edmond Edelson, M. D.

EE:AR

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 38:28–39 (2000)

A Retrospective Job Exposure Matrix for Estimating Exposure to 2,3,7,8-Tetrachlorodibenzo-p-dioxin

Laurie Piacitelli, MS,* David Marlow, BS, Marilyn Fingerhut, PhD, Kyle Steenland, PhD, and Marie H. Sweeney, PhD

Background *A job exposure matrix was developed to estimate the 2,3,7,8-tetrachlorodibenzo-p-dioxin exposure of 3,538 workers who produced 2,4,5-trichlorophenol and its derivatives.*
Methods *Daily TCDD exposure scores that were plant, process, and period specific were estimated for each job title as the product of 1) the concentration of TCDD (µg/g); 2) a qualitative factor to account for the extent of worker contact and 3) time exposed to TCDD contamination. Daily scores were summed to compute individual cumulative TCDD exposure scores.*
Results *Daily TCDD exposure scores ranged from 0.001 to 1,250. Cumulative TCDD scores ranged from 0.002 to 1,559,430. The 393 workers with records of chloracne in the TCDD exposure cohort (11%) had markedly higher cumulative scores than those with no record of chloracne (a median score of 11,546 vs. 77).*
Conclusion *The cumulative TCDD exposure scores incorporate both duration and level of exposure, and permit the relative ranking of worker exposures for the evaluation of exposure–response relationships between TCDD exposure and mortality in an updated cohort study analysis.* Am. J. Ind. Med. 38:28–39, 2000.
Published 2000 Wiley-Liss, Inc.†

KEY WORDS: dioxin; TCDD; exposure assessment; Agent Orange; 2,4,5-trichlorophenol; phenoxy herbicides

INTRODUCTION

In 1991, the National Institute for Occupational Safety and Health (NIOSH) published a cohort mortality study of workers with exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) [Fingerhut et al., 1991]. Duration of exposure to TCDD contaminated products was used as a surrogate of cumulative TCDD exposure in some analyses. For a subset of 253 workers from two plants, duration of exposure was correlated with serum dioxin levels ($r = 0.72$, $P < 0.0001$). However, the use of duration as a surrogate for cumulative exposure assumes no systematic variation in the average level of exposure over time and among workers, jobs, and plants. Based on a review by NIOSH staff of the operations at these plants, there were inter- and intra-plant, job and calendar time dependent differences in the level of TCDD exposure. Consequently, the use of duration of assignment to processes with TCDD contamination as an exposure surrogate may have contributed to misclassification of the relative exposure levels of cohort members. To reduce this misclassification a job exposure matrix was developed to estimate historic TCDD exposures for exposure–response analyses in a follow-up mortality study [Steenland et al., 1999].

National Institute for Occupational Safety and Health, Cincinnati, Ohio
*Correspondence to: Laurie Piacitelli, NIOSH, 4676 Columbia Parkway, MS R14, Cincinnati, OH 45226. E-mail: lap1@cdc.gov

Accepted 26 February 2000

BACKGROUND

Workers were exposed to TCDD during the production of 2,4,5-trichlorophenol (TCP) or one of its derivatives such as 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) ester which was used to formulate the herbicide Agent Orange. Other derivatives included the herbicides 2-(2,4,5-trichlorophenoxy)propionic acid (silvex), 2-(2,4,5-trichlorophenoxy)-ethyl 2,2-dichloropropionate (erbon), the insecticide 0,0-dimethyl 0-(2,4,5-trichlorophenyl)phosphorothioate (ronnel) and the bactericide 2,2′methylene-bis-[3,4,6-trichlorophenol] hexachlorophene. The unintentional formation of TCDD occurred primarily during the production of TCP (or its sodium salt) by the hydrolysis of 1,2,4,5-tetrachlorobenzene. The concentration of TCDD in TCP and derivatives depended on process operating parameters, such as temperature, pressure and reaction time, and the level of purification.

The manufacture of TCP began as early as the 1940s, with maximal production occurring in the 1960s due to the demand for Agent Orange in the Vietnam war [IARC, 1997]. Following the war, production was phased out; most uses of 2,4,5-T and silvex were suspended in 1979 and were banned in the United States in 1983 [Fed Regist 1979a, b; Fed Regist, 1983].

MATERIALS AND METHODS

Definition of the Exposure Matrix Cohort

NIOSH industrial hygienists, who were blind to the vital status of workers, reviewed thousands of pages of documents describing processes, job duties and exposures and interviewed long-term employees. Site reports were prepared for each plant and were reviewed for accuracy by the company, and by the unions where applicable [Fingerhut et al., 1984; Marlow et al., 1984, 1986, 1987, 1989, 1990, 1991a, 1991b, 1991c, 1991d, 1997; Piacitelli et al., 1990].

Of the 12 plants in the NIOSH TCDD mortality study [Fingerhut et al., 1991], four were excluded from the TCDD exposure matrix. Plants 2, 5, 6 and 12 were excluded because of limited records describing the level of TCDD contamination in process streams and/or lack of sufficiently detailed work history records. Additional workers from the remaining eight plants were excluded because they lacked adequate records to characterize duration of exposure (n = 238) or they worked in a process in which TCDD contamination could not be estimated (n = 38). Finally, 727 workers who had exposure to both pentachlorophenol (PCP) and TCDD were excluded to avoid possible confounding in the epidemiologic study by the higher chlorinated dioxins and furans formed as byproducts during the production of PCP. These dioxins are thought to act similarly to TCDD, although they are considered less toxic [IARC, 1997]. Cumulative TCDD exposure scores were estimated for 3,538 workers from eight plants (69% of the original mortality cohort). Table 1 lists the TCDD contaminated production processes and dates of their operation at the eight plants [Marlow et al., 1984, 1986, 1989, 1990, 1991c, 1991d, 1997; Piacitelli et al., 1990].

Routes of Exposure to TCDD

Dermal, gastrointestinal and transpulmonary absorptions represent potential routes for exposure to TCDD [IARC, 1997]. Dermal contact with TCDD was the most likely route of exposure given the low vapor pressure of TCDD (7.4×10^{-10} mm Hg at 25°C) and its persistence in the environment. Opportunities for exposure due to inhalation to TCDD in the gaseous form were limited; there was the potential for exposure to airborne TCDD contaminated particulates for processes with drying, grinding, and packaging operations. As with other occupational exposures where skin contact has occurred, workers had the potential for ingestion of TCDD due to the transfer of materials from the hand and face to the mouth during activities such as eating and smoking [Roels et al., 1982; Ulenbelt et al.,1990; Far et al., 1993; Karita et al., 1997].

Algorithm for Estimating TCDD Exposure Scores

An algorithm was used to estimate daily TCDD exposure scores that was based on 1) the concentration of TCDD in micrograms per gram (μg/g) in process materials, 2) a qualitative contact factor (0.01 – 1.5) to account for the extent of dermal contact with TCDD and exposure to airborne TCDD particulates, and 3) time exposed to TCDD contamination, expressed as a fraction of a work day. These three factors were multiplied together to yield a daily TCDD exposure score:

$$\begin{aligned}&\text{Daily TCDD Exposure Score}\\&\quad = \text{TCDD Concentration } (\mu g/g)\\&\quad \times \text{Contact Level } (0.01 - 1.5)\\&\quad \times \text{Time Exposed (fraction of a day)}\end{aligned}$$

The algorithm computes numeric exposure scores which cannot be directly interpreted as dose. It was not known what fraction of TCDD was transferred to the skin from contact with process materials and surface contamination nor what fraction was absorbed via dermal penetration, ingestion or inhalation. Rather, the scores are computed in a consistent manner, to provide a numeric value that can be used to rank worker exposures relative to other workers in the cohort.

TABLE I. Number of Workers and Years of Operation of TCDD Contaminated Production Processes by Plant

Plant	Number of workers	NaTCP	2,4,5-TCP	2,4,5-Tacid	2,4,5-T-ester	2,4,5-Tamine	Silvex	Ronnel	Erbon	HCP
01	439	Feb 51–Aug 69		Feb 51–Aug 69	Feb 51–Aug 69	Feb 51–Aug 69				
03	665	Oct 57–Apr 79*		Oct 57–Apr 79*	Oct 57–Apr 79*	Oct 57–Apr 79*	Oct 71–Apr 79*			
04	355		Jan 57–Apr 59	Jan 57–Apr 59	Jan 57–Apr 59 Jan 63–Oct 78	Jan 63–Oct 78	Jan 64–Oct 78			
07	54				Aug 60–Jan 70					
08	202	Apr 48–Dec 69		Apr 48–Dec 69						
09	1408	Mar 42–Feb 79	Jan 46–Dec 72	Jan 48–May 71	Mar 50–Feb 79	Jan 50–Dec 83	Jan 58–Nov 78	Jan 55–Dec 74	Jan 55–Dec 74	
10	262	Jan 49–Jun 72	Jan 49–Jun 72							
11	153									Jan 50–May 84

*TCDD process operation was not continuous.
NaTCP = sodium 2,4,5-trichlorophenate, 2,4,5-TCP = 2,4,5-trichlorophenol, 2,4,5-Tacid = 2,4,5-trichlorophenoxyacetic acid, 2,4,5-Tester = 2,4,5-Tester produced from 2,4,5-Tacid, Silvex = 2-(2,4,5-trichlorophenoxy) propionic acid, Ronnel = 0,0-dimethyl-0-(2,4,5-trichlorophenyl) phosphorothioate, Erbon = 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate, HCP = 2,2′-methylene-bis-(3,4,6-trichlorophenol) (hexachlorophene).

The TCDD exposure scores were computed by job and were plant, process, and calendar time specific. The cohort included only those workers at the plants with records of assignment to processes contaminated with TCDD. Detailed work history records were used to determine daily TCDD exposure scores for each worker in the cohort for all time periods the worker was assigned to TCDD contaminated process areas. Time worked in nonexposed areas was not counted. The sum of the daily exposure scores constituted an individual's cumulative exposure score.

Description of Algorithm Factors

Values were assigned to the algorithm factors for calendar time periods of exposure when conditions in a work area remained approximately constant. A new exposure time period was initiated whenever: 1) the concentration of TCDD in products, process streams and/or wastes changed; or 2) substantial documented changes took place in process operating conditions, engineering controls, or relative production volumes.

TCDD Concentration

Bulk sampling data describing the level of TCDD contamination in process materials were collected by NIOSH from the individual companies, several independent laboratories, the Department of Agriculture, and the Department of Defense [Woolson et al., 1972; Fee et al., 1975; Tiernan, 1976]. More than 12,000 sample results were obtained. Just over half of the analytical data came from Plant 9, which also contributed the greatest number of workers and years of operation of TCDD contaminated processes. As shown in Table II, the TCDD concentration varied between plants and over time. The level of TCDD contamination in TCP and TCP derivatives depended on process operating parameters, such as temperature, pressure and reaction time, and the level of purification. Plants 3, 9 and 10 reduced the concentration of TCDD in TCP through distillations and /or decantations, which resulted in TCDD being concentrated in the still bottoms and waste oils. The mean TCDD concentration in the still bottoms and waste oils ranged from 24 μg/g to more than 2,000 μg/g. Plant 1 installed an activated carbon filter in 1967 to reduce TCDD levels. Plants 4 and 11 primarily purchased purified TCP to produce derivatives. For all plants, the mean level of TCDD in TCP and derivatives ranged from 0.001 μg/g to 25 μg/g.

Arithmetic means of the TCDD sample results for a given process for a specific calendar time period were used to compute TCDD exposure scores [Seixas et al., 1988]. Sample results less than the limit of detection (LOD) were assigned one-half the limit of detection to estimate mean TCDD concentrations [Hornung et al., 1990]. The estimated mean TCDD concentrations for computing TCDD exposure

TABLE II. Bulk Sampling Data

Plant	Substance	Dates	# Samples (# non-detectable)	TCDD concentration (micrograms per gram) Mean*	Range	
1	Na 2,4,5-TCP	1965–1967	30	17.5	2.4	42
1	Na 2,4,5-TCP	1967–1969	31 (15)	0.64	0.45	2.8
1	2,4,5-T	1965–1966	15	18.6	5	50
1	2,4,5-T	1967	3	0.71	0.15	1.5
3	2,4,5-T	1965	24	1.9	0.4	3.3
3	2,4,5-T	1967–1970	8 (8)	0.09	—	—
3	2,4,5-T	1972–1979	610 (584)	0.05	0.009	2
3	Still bottoms	1978–1979	2	39	37.8	40
4	Na 2,4,5-TCP	1967–1968	12 (4)	0.2	0.7	1
4	Na 2,4,5-TCP	1971	148 (128)	0.8	0.1	3
4	Na 2,4,5-TCP	1972–1977	1,799 (1,763)	0.05	0.02	2.5
4	2,4,5-T/ester	1970	4	0.75	0.1	1.42
4	Silvex/ester	1970	17	2.8	0.9	9.5
4	2,4,5-T/ester	1971	142 (69)	0.86	0.1	7.4
4	Silvex/ester	1971	121 (25)	0.65	0.1	4
4	2,4,5-T/ester	1972	42 (24)	0.55	0.05	3.9
4	Silvex/ester	1972	148 (59)	0.56	0.1	7.7
4	2,4,5-T/ester	1973	110 (110)	0.05	—	—
4	Silvex/ester	1973	96 (76)	0.17	0.15	2.4
4	2,4,5-T/ester	1974–1977	446 (429)	0.05	0.01	0.25
4	Silvex/ester	1974–1977	83 (83)	0.05	—	—
4	2,4,5-T Formulations	1974–1977	167 (165)	0.05	0.01	0.2
7 and 8†	2,4,5-T	1958–1964	8	9.9	5	12
7 and 8†	2,4,5-T	1965	17	23	5	55
7 and 8†	2,4,5-T	1965	13	8.7	6.5	11
7 and 8†	2,4,5-T	1966	27	10.5	3	28
7 and 8†	2,4,5-T	1967	116 (8)	8.8	1	25
7 and 8†	2,4,5-T	1968	29 (12)	3.4	3	12
7 and 8†	2,4,5-T	1969	83	2	0.3	22
9	NaTCP	1964–1965	96 (23)	2.1	0.6	16
9	NaTCP decanted wastes	1962–1965	80	2,145	1.6	9,680
9	NaTCP decanted wastes	1966–1978	258 (15)	26.0	0.005	190
9	TCP still bottoms	1964–1965	21 (5)	688	5	3,600
9	TCP still bottoms	1966–1977	19	9.9	1.8	19
9	TCP	1964–1965	100 (89)	0.95	0.8	20
9	TCP	1967	183 (183)	0.5	—	—
9	TCP	1968	84 (84)	0.5	—	—
9	TCP	1970	57 (54)	0.28	0.63	1.3
9	TCP	1971	143 (65)	0.1	0.01	0.1
9	TCP	1972	251 (165)	0.02	0.01	0.1
9	TCP	1973–1978	1546 (1460)	0.007	0.0005	0.06
9	2,4,5-T	1965	109 (76)	0.66	1	3.1
9	2,4,5-T	1969–1973	115 (8)	0.11	0.05	0.44
9	2,4,5-T ester	1972–1978	3,450 (614)	0.05	0.001	2.8
9	Agent Orange	1966–1970	26 (26)	0.33	—	—
9	2,4,5-T amine	1971—1978	61 (37)	0.02	0.01	0.07
9	Silvex	1970–1973	48 (31)	0.16	0.07	1.5

TABLE II. *(Continued)*

Plant	Substance	Dates	# Samples (# non-detectable)	TCDD concentration (micrograms per gram) Mean*	Range	
9	Silvex ester	1965–1978	101 (27)	0.03	0.01	0.18
9	Ronnel	1966	1	0.07	—	—
9	Ronnel	1967–1970	10 (10)	0.15	—	—
9	Ronnel	1973–1978	207 (195)	0.004	0.001	0.02
9	Erbon	1973–1975	102 (38)	0.04	0.004	0.22
9	Tordon	1974–1978	67 (6)	0.03	0.01	0.07
10	Crude TCP	1965–1970	5	25	12	47
10	Still Bottoms	1965–1970	2	362	230	494
10	TCP	1965	40 (40)	0.5	—	—
10	TCP	1970	9 (9)	0.07	—	—
10	TCP	1971—1976	27 (21)	0.01	0.001	0.032
11	TCP	1976–1983	142 (134)	0.001	0.001	0.004
11	HCP	1970–1971	23 (23)	0.01	—	—
11	HCP	1976–1977	213 (195)	0.001	0.001	0.004

*Mean of all samples, nondetectable results set to limit of detection/2.

NaTCP = sodium 2,4,5-trichlorophenate, 2,4,5-TCP = 2,4,5-trichlorophenol, 2,4,5-Tacid = 2,4,5-trichlorophenoxyacetic acid, 2,4,5-Tester = 2,4,5-Tester produced from 2,4,5-Tacid, Silvex = 2-(2,4,5-trichlorophenoxy) propionic acid, Ronnel = 0,0-dimethyl-0-(2,4,5-trichlorophenyl) phosphorothioate, Erbon = 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate, HCP = 2,2′-methylene-bis-(3,4,6-trichlorophenol)(hexachlorophene).

†2,4,5-T produced at Plant 8 was esterified and formulated at Plant 7.

scores were less precise for TCP processes that included distillation or decantation than for other processes with less variability in the TCDD concentration. The mean TCDD concentrations used in the algorithm to compute exposure scores for routine process operations ranged from 0.001 to 350 μg/g TCDD.

Although TCP production began in the 1940s, analytic data for TCDD are available only for the later years of production, primarily from 1965 to 1983. In the mid-1960s, a vapor phase chromatography (VPC) method was developed which had detection limits around 1 part per million (ppm). Development of a gas chromatography/mass spectrometric (GC-MS) method dropped the limit of detection to the part per billion range in the 1970s [IARC, 1997; Marlow et al., 1991d].

For computation of TCDD exposure estimates for time periods before 1965, we used: 1) an estimated TCDD concentration based on rabbit ear tests for chloracnegens (Plant 9); 2) the TCDD concentration of archived samples (Plants 3 and 8); or 3) the TCDD concentration of process samples after 1964 when analytical data were available (all other plants).

As early as the 1940s, Plant 9 tested process samples in rabbit ears for chloracnegens and graded the development and severity of acnegenic activity from 0 to 4. After the development of TCDD analytical methods in the 1960s, Plant 9 chemists evaluated the grading scheme and found that TCDD contaminated process samples with grade 0 "no folliculitis" corresponded to a concentration of < 1 microgram TCDD per gram (μg/g), while grade 4 "severe folliculitis" developed at TCDD concentrations > 100 μg/g. Using the TCDD values for the acnegenic categories, information regarding changes in severity of response relative to process changes, and TCDD concentrations measured for the same process in the 1960s, we estimated TCDD concentrations for Plant 9 from 1942 until TCDD measurements were available in the 1960s. Analysis of archived samples at Plant 3 provided information on the level of TCDD contamination before major process changes occurred in 1965. Plant 8 had archived samples dating from 1958 that were useful for describing the level of TCDD concentration before 1965.

Interviews with plant personnel and review of process records indicated that most plants did not institute process changes to limit the level of TCDD contamination until the late 1960s. Therefore, TCDD measurements on samples of process materials taken before controls were instituted in the plants to reduce TCDD levels were used to compute TCDD exposure scores for production periods prior to 1965.

We were able to evaluate the TCDD data reported by five of the eight plants using results of TCDD analyses conducted for the Department of Defense (DOD) to characterize the TCDD content of Agent Orange stocks remaining after the Vietnam War [Fee et al., 1975; Tiernan,

TABLE III. Comparison of Plant and Department of Defense Analyses for TCDD

Source of analytical data	Substance analyzed	Production dates	Number of samples (# ND)	Mean TCDD concentration[†] micrograms per gram (standard deviation)	
				Agent Orange	2,4,5-T
Plant 1					
Plant 1	2,4,5-T	1965–66	15	—	18.6 (± 14.9)
Dept. of Defense	Agent Orange ASN 18[‡]	Not available	16 (1)	11.4 (± 3.4)	22.8[§]
Dept. of Defense	Agent Orange ASN 11[‡]	Not available	30	6.3 (± 2.2)	12.6[§]
Plant 3					
Plant 3	2,4,5-T	1967–70	8 (8)	—	< 0.2
Dept. of Defense	Agent Orange ASN 14[‡]	Not available	48 (44)	0.01	0.02[§]
Dept. of Defense	Agent Orange ASN 8[‡]	Not available	55 (55)	0.01	0.02[§]
Plants 7 and 8[*]					
Plant 8	2,4,5-T	1965	17	—	23 (± 13.7)
Plant 8	2,4,5-T	1966	27	—	10.5 (± 6.2)
Plant 8	2,4,5-T	1967	116 (8)	—	8.8 (± 5.8)
Plant 8	2,4,5-T	1968	29 (12)		3.4 (± 2.9)
Dept. of Defense	Agent Orange ASN 6[‡]	Not available	30	12.3 (± 2.0)	24.6[§]
Plant 9					
Plant 9	Agent Orange	1966–1970	26 (26)	0.33	0.66[§]
Dept. of Defense	Agent Orange ASN 10[‡]	Not available	105 (2)	0.26 (± 0.13)	0.52[§]

[†] Mean of all samples, non-detectables set to limit of detection/2 2,4,5-T = 2,4,5-trichlorophenoxyacetic acid.
[‡] Analytical Sequence number identifying Agent Orange procurement.
[§] TCDD concentration doubled to compare to 2,4,5-T/ester used to formulate Agent Orange.
[*] 2,4,5-T produced at Plant 8 was esterified and formulated at Plant 7.

1976]. Plant 9 reported TCDD data for Agent Orange. However Plants 1, 3, 7, and 8, reported the level of TCDD in the 2,4,5-T used to produce Agent Orange. The TCDD concentration in Agent Orange was approximately half of the TCDD concentration in the 2,4,5-T that was esterified and formulated to Agent Orange. Agent Orange was a 50 : 50 mixture of the esters of 2,4,5-T and 2,4-dichlorophenoxy acetic acid (2,4-D), and 2,4-D did not contain TCDD. The TCDD concentrations reported for Agent Orange are provided in Table III and are doubled to allow a comparison to the plant data for 2,4,5-T. The independent analyses, conducted by a single contract laboratory for the Department of Defense, confirm the low TCDD concentrations reported for Plants 3 and 9, and the higher levels reported for Plants 1, 7 and 8 (Table III).

Contact Factor

To estimate the potential for contact with TCDD, job titles were grouped into seven broad categories, including production workers (64.7%), maintenance (21.5%), plant supervisors (2.8%), working supervisors (2.0%), engineers (1.6%), chemists (4.3%) and workers assigned to other processes adjacent to a TCDD process (proximity exposure—3.2%). Contact factors were used to estimate the relative difference in exposure due to job tasks based on the potential for dermal exposure and the inhalation of TCDD contaminated particulates. Job and process descriptions and industrial hygiene surveys were used to estimate the relative level of exposure among jobs by assessing factors associated with dermal exposure and absorption such as skin loading, the location and extent of skin surface area contamination, and frequency of contact [Grandjean, 1990; Wester and Maibach, 1991; Fenske, 1993]. A contact factor is also used to account for inhalation. Due to the low vapor pressure of TCDD (7.4×10^{-10} mm Hg at 25°C), inhalation of TCDD in the gaseous form was expected to have been low; however, there was the potential for exposure to airborne TCDD contaminated particulates for processes with drying, grinding and packaging operations.

Direct contact with process materials occurred during the operation of the process. Indirect contact also occurred when skin or clothing touched surfaces contaminated with TCDD from leaks, drips and spills in production areas and by the transfer of TCDD contamination from equipment and workers' gloves and clothes to other surfaces. Wipe sampling data collected at Plants 3, 9 and 11 showed TCDD contamination in production areas as well as other areas such as control rooms, offices, and lunch and locker rooms [Marlow et al., 1987, 1991; Piacitelli et al., 1991].

TABLE IV. Contact Factors

Indirect Contact Values	
0.01	Exceptional minimal contact assigned to workers adjacent to a TCDD process with documented safety and work practice precautions over and above other sites in the cohort.
0.05	Minimal contact with TCDD contamination from repeated contact with contaminated surfaces, wearing contaminated clothes or gloves. Assigned to adjacent production workers on non -TCDD contaminated process in a TCDD process area. Office and administrative tasks of plant and working supervisors, chemist and engineer.
0.10	Contact with TCDD contaminated equipment as well as area surfaces, contaminated clothes or personal protective equipment. Assigned to workers who alternately produced both non-TCDD product (2,4-D ester) using the same equipment used to produce TCDD product (2,4,5-T ester). Assigned to job duties outside process area for maintenance workers who maintained both TCDD and non-TCDD processes.
0.25	Contact due to the repair of contaminated process equipment in the shop, using contaminated tools, wearing contaminated clothes and gloves. Assigned to job duties outside the process area for maintenance workers who were primarily responsible for TCDD contaminated processes.
Direct Contact Values	
0.50	Moderate direct contact with process materials relative to production workers. Assigned to working supervisors, chemists, engineers typically exposed to smaller amounts of process materials than production workers over limited skin surface area (e.g. hands and arms), some exposure to greater amount of materials over larger skin surface but less routinely than production workers.
0.75	Production work in state of art process built to reduce worker exposure.
1.0	Production and maintenance work had the potential for repeated direct contact with TCDD contaminated process materials on a routine basis, exposed skin area could include the face, head, neck, arms, hands, torso, legs, and feet.
1.25	Exceptional direct contact due to manually intensive tasks done on a routine basis that had the potential for contact with greater amount of TCDD contaminated materials over larger area of body. Assigned to jobs involving manual transfer of material such as shoveling TCDD contaminated process materials, and digging out centrifuges. Also assigned to cleanup of TCDD released during TCP reactor explosions.
1.50	Production work with exposure to TCDD contaminated dusts due to drying, grinding, packaging operations.

Production workers had repeated opportunity for contacting TCDD contaminated material while operating the process. Tasks such as collecting samples, mixing and transferring process materials, drumming product, cleaning vessels and spills as well as unplugging lines had the potential for repeated dermal contact of the hands and could include arms, head, neck, legs, and feet. The level of contact for routine production work was set to 1. All other assessments were made relative to this value. A range of eight contact factors (0.01, 0.05, 0.1, 0.25, 0.5, 0.75, 1.0, 1.25) was used to account for different levels of dermal exposure due to skin loading, location and extent of skin surface area contamination, and frequency of contact based on job duties. An additional factor (1.5) was used to account for exposure to TCDD contaminated particulates. These contact values are based on industrial hygiene judgment and are described in Table IV.

Time Exposed

Exposure was estimated per workday. Production workers were assigned a full day duration (a value of 1) in the process area with the opportunity for repeated contact with TCDD on a routine basis. Production support personnel, such as working supervisors and engineers, had process related duties and as well as other duties indirectly associated with the process. Job duties and exposure descriptions were used to time-weight exposure by intensity using contact level factors (Table V).

Some workers were responsible for multiple processes or products, which were not all contaminated with TCDD. The exposure assignments were adjusted to reflect time spent with direct exposure to TCDD. For example, ester operators used the same equipment to make both 2,4,5-T esters (which contained TCDD) and 2,4-D esters (which did not contain TCDD). Their exposure was computed by time weighting TCDD exposure by relative production volume estimates which ranged from 20% to 100% 2,4,5-T esters. Some workers had jobs that spanned multiple processes, not all of which were contaminated with TCDD but were typically located in the same building. These workers were assumed to have worked an equal amount of time on each process, but were assigned different contact levels to account for exposure due to direct contact while working on a TCDD process and indirect contact while working on an adjacent process.

Example Computations of TCDD Exposure Scores

Table VI provides examples of computations of the daily TCDD exposure scores for a sample of job titles assigned to the 2,4,5-T process building at Plant 9 for the exposure time period 1948 to 1966. The TCDD concentra-

TABLE V. Time-weighted Contact Assignments

Maintenance Workers	Maintaining and cleaning process equipment, fixing leaks and spills, repairing pumps, conveyors, lines and equipment resulted in dermal contact. Indirect exposure occurred from repair of contaminated equipment in shop, using contaminated tools, and wearing contaminated clothes. Maintenance workers at Plants 3 and 9 were assigned 75% of a day at a direct contact value of 1; and 25% of a day at the indirect contact value of 0.25. Maintenance workers at Plants 1 and 4 were estimated to spend 40% of their time maintaining TCDD processes, while at Plant 10 repairmen were estimated to spend 10% of their time maintaining a TCDD process. Maintenance workers at Plant 10 who had less direct exposure were assigned a lower indirect contact value of 0.1 to account for relatively less TCDD contamination of shop, tools etc.. Maintenance workers at Plants 7, 8 and 11 could not be linked to TCDD processes and therefore were excluded.
Chemist	Contact with TCDD process materials occurred while handling samples, running tests, cleaning glass ware etc.. Chemists had relatively less extensive contact than production worker due to exposure to smaller amounts of process materials over a smaller skin surface area, primarily hands and arms. They were assigned 50% of the day at direct contact value of 0.5, and 50% of the day at the minimal indirect contact level of 0.05 while performing office duties, recording results and preparing reports.
Engineer	50% of the time in process area supervising operations, trouble shooting, collecting samples, making and evaluating process improvements. Moderate contact with process materials relative to production workers, assigned a contact level of 0.5. Remaining 50% of day at minimal indirect contact of 0.05 for administrative and office duties, office often in process building.
Working Supervisors	75% of the day overseeing process operations, trouble shooting, and providing relief to production workers at an average contact level of 0.5, remainder of the day (25%) performing office and administrative duties at indirect contact level of 0.05.

TABLE VI. Examples of Daily TCDD Exposure Score Computations by Plant and Job Category

	Applicable exposure time period		Daily TCDD exposure						
			Direct exposure			Indirect exposure			
Plant and job	Begin date	End date	TCDD conc (μg/g)[¶]	Time (fraction of day)	Contact level (0–1.5)	TCDD conc (μg/g)[¶]	Time (fraction of day)	Contact level (0–1.5)	Daily TCDD exposure score (direct+indirect)[‡]
Plant 9 - 2,4,5-T process									
2,4,5-T operator	Jan 1948	May 1966	0.66	1	1	—	—	—	0.66
Maintenance	Jan 1948	May 1966	0.66	0.75	1	0.66	0.25	0.25	0.54
Chemist	Jan 1948	May 1966	0.66	0.5	0.5	0.66	0.5	0.05	0.18
Plant 1 - 2,4,5-T process									
2,4,5-T operator	Feb 1951	Aug 1967	18.6	1	1	—	—	—	18.6
2,4,5-T operator	Sept 1967	Aug 1969	0.71	1	1	—	—	—	0.71

‡Daily TCDD exposure score = sum of direct exposure (TCDD concentration × Time × Contact) and indirect exposure (TCDD concentration × Time × Contact).
¶Applicable plant, department and time specific TCDD concentration in micrograms per gram of process material.

tion for this exposure period was 0.66 μg/g based on the analysis of 109 samples of 2,4,5-T analyzed by Plant 9 in 1965. Job duties and exposure descriptions were used to time-weight exposure by intensity using direct and indirect contact level factors. For this process, 2,4,5-T operators were assigned the highest exposure score of 0.66, maintenance workers scored slightly lower with a score of 0.54, with the lowest exposure score of 0.18 assigned to chemists. To illustrate plant and time period differences, the exposure scores for 2,4,5-T reactor operators at Plant 1 are provided for the exposure time period from 1951 to August 1967 and for a second exposure time period, September 1967 to August 1969. Following the addition of a charcoal filter in September 1967 to reduce the TCDD concentration, the TCDD exposure score for 2,4,5-T operators at Plant 1 dropped from 18.6 to 0.71 μg/g, which was similar to the Plant 9 score where purified TCP was also used to produce 2,4,5-T. For each worker, work history records were used to assign the appropriate daily score. The daily scores were accumulated over time to give a cumulative exposure score.

ACCIDENTS

Major incidents involving TCDD exposure occurred at Plants 3, 4, and 8. Runaway reactions in the TCP reactors resulted in the rapid increase of temperature and pressure with the explosive release of reactor contents. These higher temperatures and pressures also resulted in the increased formation of TCDD. However, there are no analytical data describing the level of TCDD associated with any of these incidents, which occurred in 1948 (Plant 8), 1959 (Plant 4) and 1974 (Plant 3). An incident also occurred at Plant 1, but worker exposure to TCDD was considered to be limited because the reactor contents were released into a river prior to the explosion and fire.

Although there are no analytical data describing TCDD concentrations associated with these accidents, serum TCDD levels were obtained between 1988 and 1992 for 138 workers who had been involved in the assessment, clean-up and demolition activities following a TCP reactor accident that occurred in Ludwigshafen, Germany in 1953 [Ott et al., 1993]. The serum TCDD levels and duration of individual exposure and descriptions of the circumstances of exposure were used by the authors in a regression model to evaluate the relationships between various exposure situations and TCDD concentrations. Based on modeling results and TCDD elimination rates, the authors concluded that the exposure intensities for workers exposed during the first 22 days after the accident were estimated to be 1000 times higher than for production employees who worked in the building after an extensive cleanup had occurred and produced products other than TCP; no TCDD contaminated processes.

The exposure intensity reported for the German clean-up workers was used as a guide to estimate the TCDD exposure of the U.S. workers involved in accidents in order to rank their exposure relative to the other workers in the cohort. An accident concentration of 1,000 μg/g was used to estimate the exposure of workers involved in the accident at Plant 8. The accident at Plant 8 was similar to the accident in Ludwigshafen, Germany [Theiss et al., 1982]. The incidents at Plants 3 and 4 appeared to be of less magnitude with respect to TCDD exposure than at Plant 8. At Plant 3, the runaway reaction was relieved by the release of the reactor contents to a holding dike, which subsequently caught fire. At Plant 4, a rapid pressure increase in the TCP reactor resulted in an explosion followed by a fire that destroyed the plant. The available descriptions of the accidents suggest that the runaway reaction period was shorter for Plants 3 and 4 than for Plant 8; therefore, potentially less dioxin was formed. In addition, the fires that occurred at Plants 3 and 4 may have reduced the concentration of TCDD formed due to thermal destruction. At Plant 8 the pressure build up was inadequately relieved through a hand vent and an emergency vent, the reaction continued until one of the vents twisted off and the reactor contents were sprayed over the building; no fire was involved. The TCDD concentration assigned to the clean-up periods for Plants 3 and 4 was 100 μg/g TCDD, which was an order of magnitude lower than the concentration estimated for Plant 8. In addition to higher TCDD

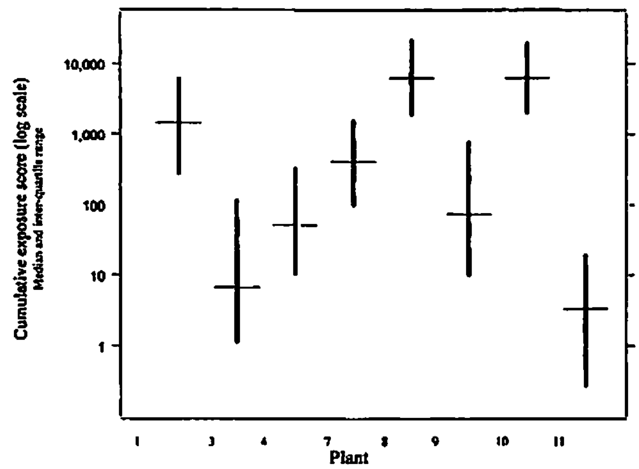


FIGURE 1. Cumulative exposure score by plant.

concentrations, the contact level was increased to 1.25 due to increased potential for skin exposure for workers involved with clean up. TCDD exposure resulting from accidents was assigned to a total of 47 workers (1% of the cohort), who were identified by plant records.

RESULTS

Daily TCDD exposure scores were determined by job and were plant and calendar time specific. The daily scores ranged from 0.001 to 1,250. Work history records were used to compute cumulative exposure scores by summing the individual's daily scores during periods exposed to TCDD over his entire work history. Cumulative exposure scores ranged from 0.002 to 1,559,430. Figure 1 shows the wide distribution of the cumulative TCDD exposure score (median and 25–75% range) by plant.

No gold standard exists to validate the exposure matrix and the TCDD exposure scores. However, records of chloracne status at eight plants and serum TCDD levels for 193 of 439 workers at Plant 1 were used to evaluate the exposure scores. Chloracnegenic response has generally been considered to be due to relatively high exposure, although the absence of chloracne does not imply a lack of exposure to TCDD. NIOSH reviewed records for each of the eight plants and identified 393 workers (11% of the exposure matrix cohort) who had chloracne during their employment. The median cumulative TCDD exposure score for the 393 workers with chloracne is 11,546 versus a median of 77 for the 3,145 workers without chloracne. This marked difference persisted when the cumulative TCDD exposure score was divided by duration of exposure (in days) to obtain the average daily exposure score (10.0 vs. 0.3). The inter-quartile (25–75%) range of cumulative exposure scores for those workers with chloracne was from 2,950 to 34,490 versus 6.8 to 1000 for those workers without records of chloracne.

Serum TCDD levels and cumulative exposure scores are only available for 193 workers at Plant 1 who participated in a medical study in 1987–1988 [Sweeney et al., 1990]. Occupational exposure for Plant 1 workers occurred between 15–37 years before the serum samples were collected; therefore, the levels were back-extrapolated to each worker's date of last exposure. The mean of the back-extrapolated serum TCDD levels for 193 of 439 workers at Plant 1 was 2,481 parts per trillion (ppt), with a range from 2 to 32,347 ppt. The Spearman Correlation Coefficient between cumulative exposure score and serum level was 0.70, and between duration and serum level it was 0.74. The exposure scores did not improve upon duration of exposure as an estimate of exposure level at this plant, probably because detailed information regarding process assignment was limited in the work history records. In addition, for 16 of the 18 years of operation, NaTCP was not purified and therefore there was little difference between the TCDD concentration in NaTCP and NaTCP derivatives. However, there were other non-TCDD contaminated processes at the plant and many job titles did not specify process assignment. According to surveys conducted at the site there was considerable job rotation and workers often worked in several locations [Birmingham et al., 1963; Poland et al.,1971]. For this plant we had limited ability to assess differences in exposure level as shown by the Spearman correlation coefficient between cumulative exposure score and duration which was 0.91. This was not the case for the overall cohort, the Spearman correlation coefficient between cumulative exposure score and duration was 0.60, indicating differences in the intensity of exposure due to differences in the level of TCDD contamination, level of contact and time exposed. It should be noted that the serum TCDD measurements are not a perfect gold standard, due in part, to the timing of collection of the serum samples, which were collected between 15–37 years after the workers were last employed in TCDD contaminated jobs. In addition, a standard half-life of 8.7 years was used to back-extrapolate although half-life can vary appreciably between individuals due to percent body fat and other individual characteristics [Michalek et al., 1996].

DISCUSSION

Exposure was evaluated indirectly using the time assigned to TCDD process areas, the level of TCDD contamination in process materials, and the degree of contact with contaminated materials based on job duties. We do not know what fraction of TCDD was transferred to the skin from contact with process materials and surface contamination nor what fraction was absorbed via dermal penetration, ingestion or inhalation. Although, we cannot quantify dose, the algorithm provides a consistent method for quantitatively describing exposure as a score that allows the ranking of workers in the cohort relative to each other. It is the relative ranking of exposure which is important for exposure–response analyses.

As with any retrospective effort to quantify exposure, this exposure assessment has a number of limitations. Although exposure for some workers occurred as early as the 1940s, the earliest analytical data is from 1958, with most plants having data beginning in the mid to late 1960s. In addition, measurements were fairly sparse for some plants and some process materials. However, the data from the acnegenic testing of process materials at Plant 9, the archived samples for Plants 3 and 8, process records and worker interviews provided a framework to estimate TCDD concentrations for the early production periods. We were able to assess the quality of the analytical data for five of the eight plants using TCDD analyses of Agent Orange stocks which showed reasonable agreement with the TCDD concentrations reported by the plants.

Differences in exposure due to potential vehicle effects (e.g., exposure to TCDD in TCP versus TCDD in 2,4,5-T) and individual factors of work practice and personal hygiene could not be addressed. It was not possible to assess retrospectively the use or efficacy of personal protective equipment (PPE). Contamination can get through or around openings of gloves and clothing [Fenske, 1988; Van Rooij et al., 1993] and contaminated PPE can be a source of exposure to workers [Quinlan et al., 1995]. In addition, although PPE has the potential for reducing exposures, it also has the potential for increasing dermal uptake through the skin due to increased penetration because of elevated skin temperature, humidity, and physical stress [Grandjean, 1990; Wester and Maibach, 1991].

Due to the large size of the original cohort, it was possible to limit the exposure matrix cohort to only those plants with the best information to characterize exposure, yet still have a sizeable cohort to study (n = 3538). It is important for the evaluation of possible exposure–response relationships that there are groups of workers with substantially different exposure levels. The analytical data from more than 12,000 samples shows a wide range of TCDD concentration in process streams, products, and waste. The substantial plant records permitted design of a job exposure matrix to account for differences in exposure among workers due to the range of TCDD concentration in process materials, duration in exposed jobs, and differences in potential contact with TCDD contaminated materials. Comparison of the cumulative TCDD exposure scores with chloracne status suggests that the matrix is reasonable and reflects the inter- and intra-plant and calendar time specific differences in exposure. The TCDD cumulative exposure scores, that permitted the relative ranking of worker exposures, have been used to evaluate exposure–response relationships between TCDD exposure and mortality in an updated cohort study analysis [Steenland et al., 1999].

ACKNOWLEDGMENTS

We thank Christine Gersic, Lih Ing Chang and Dennis Zaebst for their support on the project. We are also grateful to the companies and unions in the exposure matrix cohort who have provided records, information and reviews.

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Dr. C. C. Kitchens
August 27, 1951

1. Prod. Div.
2. Dr. Kitchens - 8/27/51
3. destroyed 9/28/70
4. ~~[illegible]~~ 8/27/51
5. destroyed 9/28/70

Recovery of G-11 from Sediment in Sewer Ditch

Project No. 97.

Introduction:

Sediment has collected in the pond, which was a part of our old sewer system. Individual samples of the sediment from various locations in the pond as well as representative samples of the whole pond have been collected and found to consist of principally G-11 and inorganic matter (sand, filtercel, grit and calcium salts).

Summary:

Representative samples of the sediment yields 60% G-11 Pure (based on the dry solid content of the sediment). The G-11 content is not uniform over the whole pond, the solids near the west end of the pond analyzes about 70% G-11, while the G-11 content near the middle and east end of the pond is about 50% G-11. The sediment from the middle and east end of the pond contains, besides G-11 and inorganic materials, about 5% of oily residue which is easily removed.

The G-11 is easily recovered as G-11 Pure by solvent or caustic extraction followed by crystallization from solvents. The best method for plant operation was found to be a slight modification of the G-11 Pure process.

Recovery Procedure:

Two hundred fifty grams (43.5% solids) of a representative sample of the sediment was agitated 30 minutes at 40°C with 620 g. of 12.5% $NaOH$ solution. 5 g. of filtercel was added and the batch was filtered giving an insoluble residue precipitate of 30 g.

The caustic solution of G-11 was extracted with 100 ml. of benzene to remove any insoluble oily material. Evaporation of the benzene extract gave 3 g. of oily residue. The sodium salt of G-11 was precipitated from the caustic solution by adjusting the pH to between 10 and 10.3 with 62½% H_2SO_4. The batch was agitated 30 minutes and the mono sodium salt of G-11 was filtered and washed with 10 ml. of water.

The caustic solution, freed of G-11, gave 8 g. of acidic materials on acidification with 62½% sulfuric acid.

G-11 was isolated from the sodium salt by suspending the salt in 200 ml. of water and acidifying to congo paper with 62½% sulfuric acid. The G-11 was filtered and washed with water. This G-11 had a good melting point, however, the color and alcohol solubility was poor.

To obtain pure G-11, the wet G-11 was added to 150 ml. of toluene and refluxed while removing the water azeotropically. 10 g. of superfiltrol was added and after refluxing 15 minutes, the toluene solution was filtered and allowed to crystallize. There was obtained 58 g. of G-11 Pure. Evaporation of the mother liquor to 50 ml.

and crystallizing gave an additional 5 g. of pure G-11. The removal of the solvent from the second mother liquor gave a residue of 6 g. of impure G-11.

The total yield of pure G-11 was 63 g. or 58%;

M.P. 163 - 164°C.

Color White

Alcohol Solubility - Clear.

DATA

SAMPLE LOCATION	% Moisture	% Based on Solid Sediment: % G-11	% NaOH insol.	% NaOH soluble at pH 10
West end	15.3%	73.5%	26.1%	trace
Center (west end)	18.6%	70.0%	26.0%	3.0%
Middle	68.8%	53.0%	23.0%	10.2%
Bottom (near middle)	50.2%	45.0%	47.0%	5.0%
South side	34.5%	51.0%	31.0%	6.4%
East end	39.6%	23.9%	20.6%	10.0%
Representative	44.7%	60.1%	31.2%	4.8%
Representative	56.5%	58.0%	22.9%	7.4%

Conclusion:

The solid sediment will yield about 60% pure G-11. The exact estimate of the total amount of G-11 available from the sediment is difficult because of the nonuniformity of the G-11 and moisture contents, however, a conservative estimate of 10,000 lbs. or more is reasonable.

Garry C Kitchens

Dr. G. C. Kitchens,
Delawanna, N. J.,
August 27, 1951.

Wr. Wowsky

LUFTPOST

CELAMERCK GMBH & CO. KG · INGELHEIM GERMANY
AFFILIATE OF CELA GMBH, INGELHEIM AND E. MERCK, DARMSTADT GERMANY

Messrs.
Givaudan Corporation
Att. Mr. Broderick
100 Delawanna Avenue

Clifton, New Jersey 07014
USA

S. Gold

6507 Ingelheim (Germany)
Ingelheim 771 Vorwahl 06132
Telegramme CELAMERCK Ingelheim
Telex 4187131-34 Boehringer Ingelheim für CELAMERCK
Bankkonten
Conrad Hinrich Donner
Hamburg 1 Nr. 1/07268
Deutsche Bank AG. Mainz Nr. 167320

Reply to:

Ihre Zeichen your ref.	Telefon Bei Durchwahl direct dialling 06132/77–	Unsere Zeichen our ref.	Datum Date
		mc/no/rbz	12 May 1978

2,4,5-Trichlorophenol

Dear Sirs,

After receipt of your telex request we airmailed to you our certificate of analysis for your order No. R 19011 and R 19131.

Today we are sending the original certificates. Please note that we indicated on this copies the drum numbers for each batch.

If there are further questions, please contact us.

Yours faithfully,

CELAMERCK GmbH & Co. KG
ppa. i.V.

CELAMERCK

CELAMERCK GmbH & Co. KG
D-6507 Ingelheim am Rhein

Untersuchungsattest No:

Certificate of Analysis

Substanz: 2,4,5-Trichlorphenol
Product:

CM-Rechnung: 08448
CM-Invoice:

Charge: 78145/5
78145/6
78145/7
Batch:

Menge: 17933,- kg
Quantity:

Kunde: Givaudan Corporation
100 Delawanna Avenue
Clifton N.J. 07014
USA
Customer:

Auftragsnummer (Kunde): R 19131
Order No. (Customer):

Analyse:
Analytical Data:

	78145/5	78145/6	78145/7
Appearance:	grey, fused mass		
Absorbance (430 nm):	0,1	0,1	0,1
2,4,5-Trichlorophenol assay (GC):	99,4 %	99,5 %	99,3 %
2,4/2,5-Dichlorophenol:	0,1 %	0,1 %	0,1 %
2,3,6-Trichlorophenol:	0,2 %	0,1 %	0,1 %
Dichloromethoxyphenol:	0,1 %	0,1 %	0,3 %
TCDD	less than 1 ppb		

Beurteilung:
Approval:

Dieses Produkt entspricht den Anforderungen
This product corresponds with the requirements

Bemerkung:
Remarks:
Batch No. 78.145/5 consists of drum No. 1 - 11
Batch No. 78.145/6 consists of drum No. 12 - 56
Batch No. 78.145/7 consists of drum No. 57 - 79

1298-CM · GX 507106 We

Datum: May 10, 1978
Date:

Analytisches Laboratorium:
Analytical laboratory

CELAMERCK GmbH & Co. K(
D-6507 Ingelheim am Rhein

Untersuchungsattest No:

Certificate of Analysis

Substanz: 2,4,5-Trichlorphenol
Product:

CM-Rechnung: 08378
CM-Invoice:

Charge: 78145/4
78145/5
Batch:

Menge: 17933.- kg
Quantity:

Kunde: Givaudan Corporation
100 Delawanna Avenue
Clifton N.J. 07014
USA
Customer:

Auftragsnummer (Kunde): R 19011
Order No. (Customer):

Analyse:
Analytical Data:

	78145/4	78145/5
Appearance:	grey, fused mass	
Absorbance (430 nm):	0,1	0,1
2,4,5-Trichlorophenol assay (GC):	99,2 %	99,4 %
2,4/2,5-Dichlorophenol:	0,1 %	0,1 %
2,3,6-Trichlorophenol:	0,3 %	0,2 %
Dichloromethoxyphenol:	0,2 %	0,1 %
TCDD:	less than 1 ppb	

Beurteilung:
Approval:

Dieses Produkt entspricht den Anforderungen
This product corresponds with the requirements

Bemerkung: Batch No. 78145/4 consists of drum No. 1 - 45
Batch No. 78145/5 consists of drum No. 46 - 79
Remarks:

Datum: May 10, 1978
Date:

Analytisches Laboratorium:
Analytical laboratory

G. F. Talarico
Clifton, N. J.
December 30, 1981

PLANT STORM WATER

The average yearly rainfall in this geographical location is 41.45 inches which results in 35 million gallons of water falling on our plant (31.43 acres) per year. The bulk of this runs off our property in one of the following ways:

1) Run off from a large part of the plant goes into the pond (about 250,000 gallons capacity) outside of Building 50. This includes water from the surface as well as that which is piped, it then evaporates or seeps into the ground.

2) During a rain storm, water from the land surrounding Building 93 runs over the drum farm area onto River Road. The earthen wall retains some of the runoff forming a good sized pond which gradually drains into the street forming ice in the winter and is the cause of many neighborhood complaints.

3) Water from the area along the railroad tracks, Buildings 79, 93, 95, drains onto the railroad property (some is actually piped from Givaudan property).

4) In those areas which are not covered by macadam, the water either goes into one of the above areas or percolates into the ground.

5) Storm water from the hill in back of 90 & 96 and surrounding area runs into a ditch which empties into a storm drain along the [illegible] [illegible].

The following discussions may be helpful in determining ways to dispose of the storm water in a safe, efficient, legal manner.

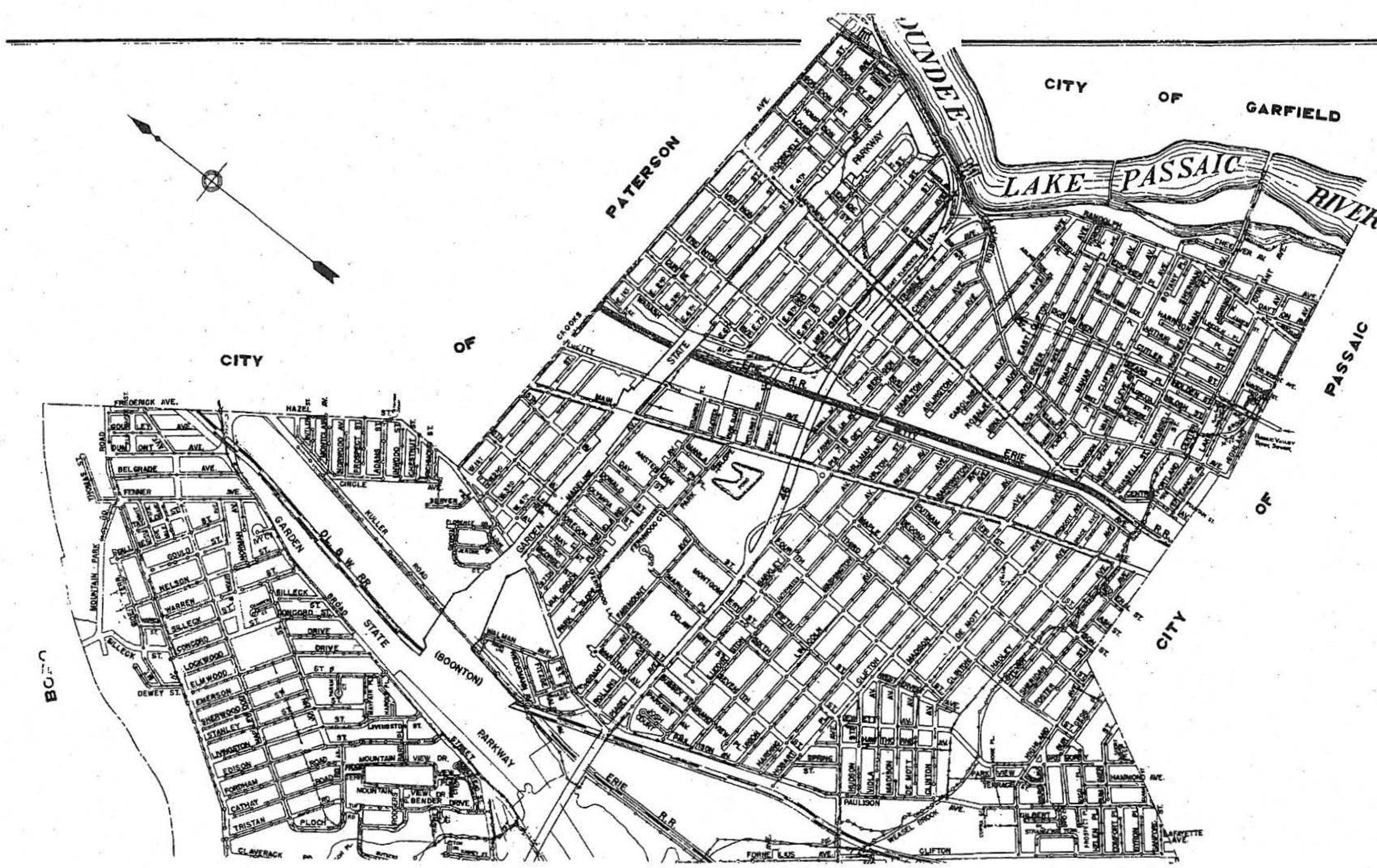
1) In the first place, it is prohibited to discharge uncontaminated storm water into the P.V.S.C. treatment works which would increase the hydraulic load during a rain storm. In other words, we cannot simply tie storm water runoff into chemical or sanitary lines without first consulting the P.V.S.C.

2) Since the present pond is in one of the lower parts of the plant, it may be to our advantage to investigate its use as both a collection system for rain water runoff as well as part of the spill prevention plan. It appears that by grading certain sections of the plant, macadamizing other parts and putting in manholes in strategic places practically all of the water would drain into the pond. It could then be treated, if necessary, and run into the Clifton storm sewer system.

In conclusion, it is felt that we should hire the talents of an outside concern to help us decide what course to follow. K. Aspinwall and I talked to C.F.M., our consultants on sewer problems, about this and feel they are well qualified to undertake this assignment.

rd

George F Talarico

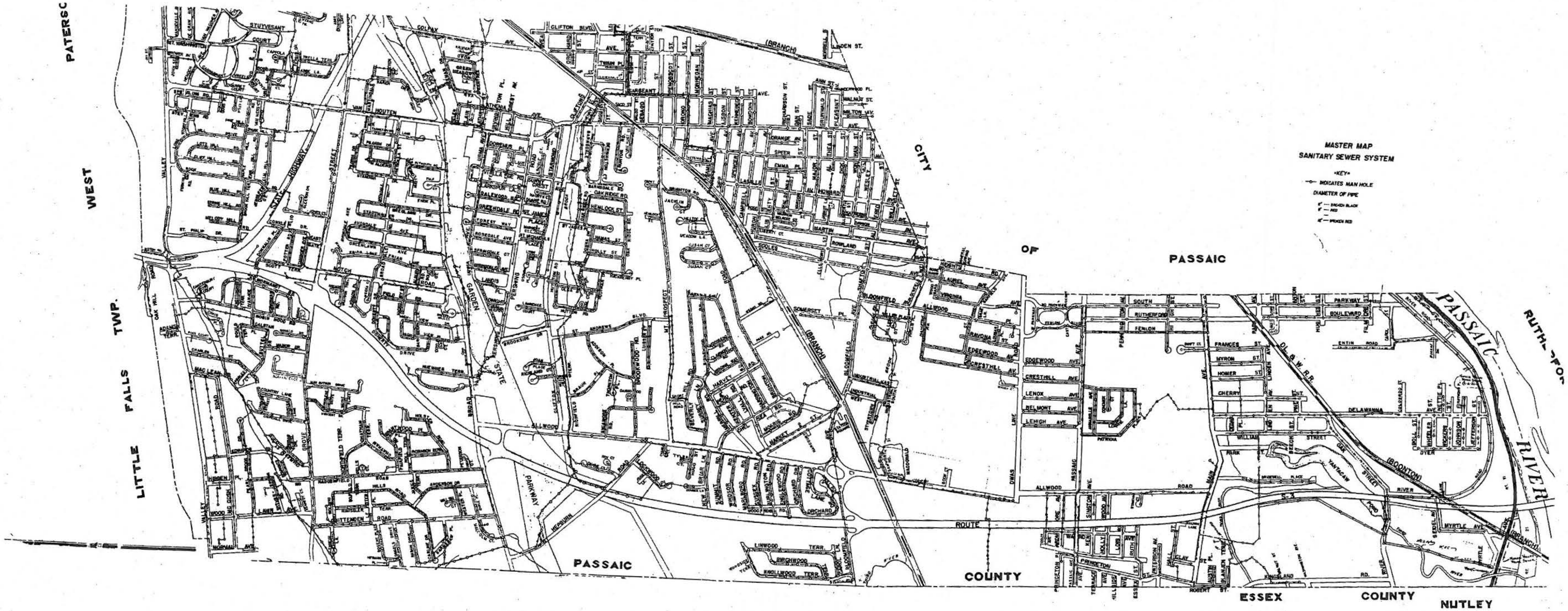


MAP
OF THE CITY OF
CLIFTON, N.J.
PLANNING BOARD

SCALE-1"=400 FEET- MARCH-1945.

COMMISSIONERS

ARTHUR RIGOLO CHAIRMAN	CHARLES F. HAHN
DAVID C. VAN DILLEN VICE-CHAIRMAN	WILLIAM F. O'BRIEN
WILLIAM E. DEWEY	WILLIAM McCOLL
JOHN L. FITZGERALD	A. FRANK MURRAY
MICHAEL SHERSHIN	LEWIS EPSTEIN SECRETARY


MASTER MAP
SANITARY SEWER SYSTEM
KEY
INDICATES MAN HOLE
DIAMETER OF PIPE
WEST
LITTLE FALLS TWP.
CITY OF PASSAIC
PASSAIC RIVER
PASSAIC COUNTY
ESSEX COUNTY
NUTLEY

L. GIVAUDAN & CIE

SOCIÉTÉ ANONYME

1214 VERNIER-GENÈVE, SUISSE
TÉLÉPHONE: 022. 41 22 00
TÉLEX: GENÈVE 23.264
TÉLÉGR: GIVAUDANCO-GENÈVE

RECEIVED AT
JUN 5 1967
DELAWANNA

Mr. Salvador Sanz
GIVAUDAN CORPORATION
New York

V/ RÉFÉRENCE

N/ RÉFÉRENCE LA/ab

VERNIER-GENÈVE
May 30, 1967

Subject: Trichlorphenol - Hooker

Dear Salvador,

As you have seen from the minutes of our last Technical Committee Meeting (No.36 of May 24), Basle is favorable to construction of a Trichlorphenol plant for Europe only. The justification is based on supply guarantee and an under 3 year investment payout.

Dr. Schett suggests that we contact Hooker in order to obtain process know-how and possible patent licences, particularly concerning tetrachlorbenzene production. Some payment would be considered.

They should be willing because:

1. They have had only small European sales for Trichlorphenol.

2. We gave them our know-how and licenced our patent for Trichlorphenol.

3. We have been a faithful customer and will continue to be so in the U.S.

4. They are letting us down on the Trichlorphenol supply although we recognize that it is not really their fault.

I talked to Paul Adams about this last week and he thought the idea was reasonable and that Hooker would cooperate.

Dr. Schett suggested that I and Mr. Hudson (factory manager of HLR plant in Dalry, Scotland) visit Hooker as soon as practical to make the necessary study. Mr. Hudson should go because he is a very capable Chemical Engineer and there is a strong possibility that the eventual plant would be located in Dalry.

./..

2015 Givaudan Containment Cell Investigation

EPA Sample ID	2,3,7,8-TCDD (pg/g)
222-0026	2,780
222-0027	475
222-0023	1,860
222-0024	4,580
222-0025	9,230


PLAN SYMBOLS
Vacant Land For Approx. 100 Ft. to 1-2 Sto. 3+ Fr. Industrial Bldgs.
Vacant Land For Approx. 100 Ft. to 1-2 Sto. 3+ Fr. Industrial Bldgs.
Property Line
SER. NO. 70891
SER. NO. 70892
SER. NO. 70893
SER. NO. 70894
SER. NO. 70895
SER. NO. 70896
No. 103
No. 105
141'-10" x 141'-8"
(1977)
No. 106
240' x 100'
(1956)
WEYERHAEUSER CO.
No. 104
No. 102
Leased From Dr. Ehrenfeld Passaic, N.J.
135 x 305
No. 100
GUARD HOUSE
PEE KAY DR.
COLORADO ST.
DELAWANNA AVE.
12 in. High Service
Direct Pumping With Overflow to Reservoir 65 lbs.
Parking
No. 84
No. 9
No. 7
No. 67
150 x 60
(1946)
No. 50
No. 50A
No. 88
No. 90
(1962)
No. 96
350,000 Gal. Suction Tank
No. 99
No. 78
No. 91
No. 74
No. 34
No. 51
No. 69
No. 70
No. 26
No. 27
No. 33
No. 97
Stge. Finished Products in Drums. 1-2 Hi.
Stge. Finished Products in Drums
Drainage Pit 15 Ft. Deep.
Stge. Empty Drums
Stge. Residues in Drums
Stge. Raw Material in Drums. 2 Hi.
Stge. Residues in 5+ Drums.
Approx. 576 Drums. 2 Hi. & 2 Wide
Approx. 1296 Drums. 2 Hi. & 2 Wide
BOLL ST.
DYER AVE.
Row of 1-2 Sto. & 2 Sto. Dwgs.
Fence & Property Line
Scattered 1 & 2 Sto. Wd. Dwgs. For Several Hundred Feet
Vacant Land For Several Hundred Feet
OAK ST.
RIVER RD.
Fence
TANK NOTE
FOR REMAINDER OF PLAN SEE
SERIAL NO'S 70891 THRU 70895
FOR KEY PLAN SEE SERIAL NO. 70897
THE GIVAUDAN CORPORATION
Clifton, N.J.
Surveyed 4-20-72
Surveyed By J. Tower
Scale 1in. =
By J. Whita
FACTORY MUTUAL ENGINEERING DIVISION
Factory Mutual System
Norwood, Mass.
SERIAL 708
Repl. 18141 & 5843
INDEX 299

Timeline of Relevant Sewer Construction/Development in the Area of the Former Givaudan Facility in Clifton, New Jersey

- June 1921: Clifton receives proposal to design complete sanitary sewer system for the City of Clifton. (*See* Exhibit A)

- June 1921: Resolution by the majority of the Sewer and Engineering Bureau Committee to adopt the proposal for sewer system design. (*See* Exhibit B)

- December 1921: PVSC installation of trunk sewer has already been completed (*see* December 6, 1921 document indicating that the "sewer has been practically completed from Paterson to Newark Bay and has been in this condition for some time."). (*See* Exhibit C)

- June 1926: Resolution to approve the construction of sanitary sewers in Delawanna section of Clifton. (*See* Exhibit D)

- November 1926: Report references increased maintenance cost of trunk sewer "partly due to the connection of the 24-inch Yantacaw Trunk in the Delawanna Section." (*See* Exhibit E)

- 1927: Givaudan appears to be already connected to sewer on Delawanna Avenue. (*See* "Record Drawings of Sanitary Sewer System", No. E-13-16, dated June 30, 1927, showing existence of sewer and connection on Delawanna Ave. to the north of the former Givaudan facility). (*See* Exhibit F)

- 1927: Sewer connections have been installed on River Road to the south of the former Givaudan facility. (*See* "Sanitary Sewer Record Drawings", No. E-13-28, dated August 16, 1927, showing existence of sewer on River Road between Oak Street and Penn Street). (*See* Exhibit G)

- 1930: Clifton Ordinance #989 prohibits discharges to the Passaic River or any of its tributaries. (*See* Exhibit H)

- November 1938: Clifton Ordinance #2129 requires connection to sanitary sewer system for all buildings located upon a street in which a sanitary sewer is constructed. (*See* Exhibit I)

- July 1939: Ordinance No. 2138 fixes the rates to be charged by the City of Clifton for sewer usage. The ordinance further states that the system is meant to provide a means of "collecting and conveying all domestic sewage, commercial and industrial waste." (*See* Exhibit J)

- 1949: Oblique aerial clearly shows three surface water impoundments containing water/liquid. (*See* Exhibit K)

- May 1951: Ordinance No. 2631 references a project to enlarge and extend the sanitary sewer system already in place in the City of Clifton. (*See* Exhibit L)

- November 1951: Ordinance No. 2671 authorizes the construction of sanitary sewers in River Road, to be connected with the trunk sewer maintained and operated by the PVSC. (*See* Exhibit M)

- 1951: Aerial shows that one of the three surface water impoundments is no longer present. (*See* Exhibit N)

- May 1952: *See* "Plan and Profile: Sanitary Sewer – Boll St.", No. E-13-442F, dated May 9, 1952, noting that residential property to the east of the former Givaudan facility is "sewered thru Givaudan Corp." (*See* Exhibit O)

- May 1952: *See* "Plan and Profile: Sanitary Sewer – Delawanna Ave.", No. E-13-442I, dated May 11, 1952, showing existence of sewer on Delawanna Ave. to the north of the former Givaudan facility and noting that "Givaudan Corp. has san. sewer." (*See* Exhibit P)

- July 1952: Ordinance No. 2716 authorizes the construction of sanitary sewers in residential neighborhood to the east of the former Clifton facility, to be connected with the existing sanitary sewer system. (*See* Exhibit Q)

- 1953: Aerial shows infilling of linear surface water impoundment. (*See* Exhibit R)

- 1954: Aerial shows continued infilling of remaining surface water impoundments. (*See* Exhibit S)

- 1955: *See* "General Property Parcel Map", No. 27/40, dated December 1955, showing existence of sewer on River Road to the south of the former Givaudan facility. (*See* Exhibit T)

EXHIBIT A

The monthly report of the City Treasurer for the month of May,1921, (Balance May 1,1921 - $39,073.04 ; Balance June 1, 1921 - $46,856.00) was received and referred to the Finance Committee.

A Communication from George L. Watson, Consulting Engineer, dated 16 East 41st St., N. Y. City, June 7th., 1921; and report of the Sewer and Engineering Bureau Committee attached; and a resolution by the majority of the Sewer and Engineering Bureau Committee was read as follows;

GEORGE L. WATSON
CONSULTING ENGINEER
16 East Forty-First Street
New York

June 7, 1921.

Sewer & Engineering Bureau Committee,
Common Council, City of Clifton,N.J.

Gentlemen;-

After considerable consultation and a very extensive examination of the City, I present herewith the following proposition.

1. I agree to make all surveys and maps and to furnish all plans, preliminary estimates and report, working drawings, specifications and form of contract to furnish a detailed set of standards covering the various details of a complete sanitary sewer system for the City of Clifton. The above to cover the entire city with the exception of the Richfield or farming section which will only be given such treatment as will include it in the general plan but not to the extent of immediate construction. The extend of the Richfield territoary to be determined more accurately by the City and myself before the execution of a formal contract.

2. I agree that the above work shall be concluded within five months from the date of beginning the work which shall not be later than ten days after signing a formal contract; and furthermore guarantee that the total cost will not exceed the following:

3. I will appoint such of my assistants as I may consider necessary from time to time, the City to pay said assistants on a monthly basis in accordance with the certificate to be rendered by me. I guarantee the total payroll for this item for a period of five months will not exceed the sum of $18,500.00 and any additional cost beyond this sum to be defrayed by me.

4. I agree to furnish all instruments and necessary supplies required for the work as outlined in paragraph one, the above for my use exclusively during this period. On the completion of the work outlined in paragraph one I will have no further use for these instruments and supplies and if the city indicates a desire for these I will be glad to turn over to them for its use such as I have purchased as above.

5. I will furnish for the use of the parties or the employees engaged by me, automobiles of standard make not to exceed three in number. On the completion of the work and in the event that the City should indicate a desire to secure one of these machines, I will turn it over to them for the use of the Engineering Bureau without compensation.

6. The city to pay me a fixed fee of $28,675.00. This fee to be divided in five equal payments to be paid at the expiration of each monthly period from the beginning of the work. Ten per cent of each monthly sum to be retained until the completion of the work and the acceptance by the city of the plans, report and specifications. This fee covers the professional services of myself, cost of instruments, automobiles overhead expense etc. dead time of my employees, the mounting and binding of the report and recommended plan and series of standards, the guarantee by me that the total payrolls under paragraph 3 will not exceed the stated fixed sum.

7. The City to furnish me, in the event that it so desires; the services of the field party of their Engineering Bureau which shall be composed of the following men; Chief of Party, Transitman, Rodman, Chainman. This party to work under my sole direction during this period. The amount of salary paid these men by the City shall be included in the total payroll of my assistants provided for in paragraph 3 and so that such salaries together with the compensation of my assistants shall not exceed the sum of $18,500.00

8. The City will furnish suitable space heated and lighted for the office force employed by me in Clifton and in addition such necessary furniture as may be available to augment that which will be furnished be me.

Thanking you for your consideration, I am,

Respectfully,
(Signed) Geo. L. Watson.

EXHIBIT B

the Common Council,
ty of Clifton, N. J.

After considerable intensive study of the sewer prob- in the City of Clifton, and with the desire in mind to get the design construction of the sewers under way as soon as possible, and at the e time in what we believe to be the most economical manner, we recom- d the following proposal by Colonel Geo. L. Watson, for the adoption the City.

Sewer and Engineering Bureau Committee.
Siebe Roosma
James W. Taylor
W. V. Negus, Jr.

RESOLUTION by the majority of the Sewer and Engineering Bureau Com- tee:-

"RESOLVED, That the proposal of Colonel George L. Watson to the Sewer Engineering Bureau Committee which has just been read, to make all veys and maps, to furnish all plans preliminaries, estimates and report, king drawings, specifications, to furnish a detailed set of standards ering the various details of a complete sanitary sewer system for this y, be and the same is hereby accepted on behalf of the City of Clifton; t he is hereby engaged to complete said work for the compensation in proposal set forth; that a formal contract embodying the said terms be pared by the City Counsel and that the same be executed by his Honor Mayor on behalf of the City of Clifton, and that the seal of the City thereto affixed and the same attested by the City Clerk.

By a majority of the Sewer Committee --- (James W. Taylor
(Siebe Roosma
(W. V. Negus, Jr.

It was regularly moved and seconded that the report of the Committee received and the resolution adopted.

Motion was amended to read that the resolution be laid over until the regular meeting of the City Council. Vote on the amendment by roll l, Councilmen Ross, Albrecht and Fenner voted "yes", Councilmen LaRue, d, Taylor, Risden, Varetoni, Roosma and Negus voted "no." Amendment

Vote upon the original motion by roll call, Councilmen La Rue, Wood, lor, Risden, Varetoni, Roosma and Negus voted "yes", Councilmen Ross, recht and Fenner voted "no." Motion carried.

The Police & Fire Committee reported approval of the following app- ations for gas tank permits and recommended that permits be issued:

Florindo Zuliani	54 Lake Avenue
Gottlieb Becker	229-231 Parker Avenue
Meyer Greenberg	571 Van Houten Avenue
Liberty Garage (by W. Zibbling)	241 Third Street

It was regularly moved and seconded the report of the Committee be curred in and permits issued. Vote by roll call, all councilmen answer- in the affirmative. Motion carried.

The following approved claims were ordered paid:-

Clifton Press Inc.	$19.75	
" " "	8.50	
" " "	15.50	
" " "	9.25	
" " "	3.00	
" " "	24.00	$80.00
Passaic Battery Station		1.50
Albret B. Tappen		58.50
Guardian Printing & Publishing Co.		40.08
Campbell & Rutka, Inc		37.50
H. W. Mills & Co.		5.51
Inglis Stationery Co.		26.80
Texas Company		49.00
Passaic Daily News		146.64
N. Y. Telephone Co.		31.90
S. F. Hayward & Co.		3.14
Public Service Electric Co.		34.20
Public Service Gas CO.		14.14
Decker-Kievit Co.		31.76
Clifton Community Garage		49.70
Anna Flameling		53.17
Orrie Meyer		20.90

EXHIBIT C

The following approved claims were ordered paid:-

Decker-Kievit Co.	$ 11.03	
" " "	23.93	$ 34.96
Finkle's Express	.65	
" "	10.00	10.65
C. H. Quadland	1.35	
" " "	56.50	57.85
Clifton Tire Exchange	5.60	
" " "	8.00	
" " "	42.90	56.50
Drake Business College, Inc.		12.00
The Texas Company		46.00
Jno. Schleich, Jr.		80.16
Fred De Bello		64.00
La Salle Mfg. Co.		5.00
Anna T. Leonard		6.30
A. C. Hazell		50.00
Manhattan Rubber Mfg. Co.		81.60
N. Y. Telephone Co.		67.25
American Gas Accumulator Co.		8.00
Berdan Furniture Co.		5.60
General Chemical Co.		6.51
N. J. State Board of Childrens' Guardians		15.50
Union Building and Construction Co.		37.55
The Barrett Company		511.9[illegible]
Inglis Stationery Co.		25.9[illegible]
Passaic Daily Herald		90.30
Passaic Daily News, Inc.		21.1[illegible]
Clifton Press, Inc.		31.10
J. J. O'Neill		100.00

A number of new claims were received and referred to the Fin[illegible] Committee.

Report of the Special Committee on the Passaic Valley Trunk S[illegible] was read as follows:-

"The Special Committee appointed to take up the matter of the Supplemental Contract for the Passaic Valley Trunk Sewer report [illegible] they do not believe it to be to the advantage of the City of Cli[illegible] to agree to any change in the original contract at the present [illegible] for the following reasons.

"To date, the total cost of the trunk sewer has amounted to [illegible] $17,000,000., of which Clifton has been assessed $215,503.44[illegible]

"The sewer has been practically completed from Paterson to Ne[illegible] Bay and has been in this condition for some time.

"We feel that before any further changes be agreed to in this [illegible] tract, it is advisable to insist that the Trunk Sewer be put in [illegible] ation at least for the Cities of Paterson, Passaic, and Clifton, [illegible] that it is advisable to insist that the Passaic Valley Sewer Comm[illegible] endeavor to secure the permission of the War Department to empty [illegible] effluent of at least these three cities in the Trunk Sewer and [illegible] direct into Newark Bay rather than wait until some indefinite dat[illegible] the future when the trunk sewer may be completed.

"This is a matter of great moment to the Public Health and we [illegible] that every effort should be made to relieve the conditions before [illegible] Summer.

"If this approval is secured and the trunk sewer used by the [illegible] mentioned cities, thereby granting relief to every city bordering [illegible] the river, we would then recommend that the City agree to enter [illegible] this additional contract to extend the trunk sewer from Newark Ba[illegible] Robin's Reef.

(Signed) W. V. Negus, Jr. [illegible]
(Signed) Hamilton M. Ross, Sr.[illegible]

It was regularly moved andseconded the report be received a[illegible] on file.

Motion was amended to read that the report be received and concurred in[illegible] upon the amendment by roll call all Councilmen answering in the [illegible] mative. Amendment carried.

Report of the Special Committee on the proposed extension o[illegible] rison and Lincoln Place was read as follows:-

EXHIBIT D

By Councilman De Rose: "RESOLVED, That the foregoing certificate by the City Engineer (J.P. White Co., to construct sanitary sewers in Delawanna Section of Clifton, Sanitary Sewer Constrct #13, amount $22,550.25, less 10% $2,255.02, amount $20,295.23) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (Union Bldg. & Const. Co., to seal coat certain streets in the City of Clifton, amount $3,840.00, less 10% $384.00, amount due $3,456.00) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (George F. Brackett, to sidewalk, curb, pave and sanitary sewer, Christie Ave., from Lakeview Ave. to Railway Ave., amount $17,584.21, less 10% $1,758.42, less prev. payts. $6,149.25, amount due $9676.54) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (George F. Brackett, to sidewalk, curb, grade and pave Washington Ave., from Main AVE to Getty Ave., amount $8,956.88, less 10% $895.68, less prev. payts. $3,701.70, amount due $4,359.50) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (Gerritsen Construction Co. to grade Piaget Ave., from Main Ave. to Howd Ave., amount $9,300.00, less 10%, $930.00, amount due $8,370.00) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (Richard S. Sowerbutt, for sidewalking, curbing, grading and paving of Althea St., from Speer Ave. to Van Houten Ave., amount $1970.00, less 10%, $197.00, amount due $1,773.00) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Van Broekhoven: "RESOLVED, That the foregoing certificate by the City Engineer (J.P. White Co., to construct a 6-inch diameter water main in Rowland Ave., from Bloomfield Ave. to the Erie Railroad, Water Cont. #9, amount $2,240.00, less 10%, $224.00, amount due $2,016.00) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer, (Van Kirk Contracting Co. to sidewalk, curb, grade, gutter and sewer Trimble Ave., from Lakeview Ave. to Howd Ave., amount $12,407.11, less 5% retainer $620.35, less prev. payts. $11,534.40, amount due $252.36) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman De Rose: "RESOLVED, That the foregoing certificate by the City Engineer (J.P. White Co., to construct a water main and sanitary sewer in Rowland Ave. and sanitary sewers in Burg Ave. and Mt. Prospect Ave., known as Sanitary Sewer Contract #14, amount $26,685.96, less 10% $2,668.59, less prev. payts. $13,520.54, amount due $10,496.83) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

By Councilman Taylor: "RESOLVED, That the foregoing certificate by the City Engineer (Van Kirk Contracting Co., to sidewalk, curb and grade East 11th St., from Lakeview Ave. to Howd Ave., amount $4,200.09, less 5% $210.00, amount due $3,990.09) be approved and that the necessary temporary improvement bonds be sold and a warrant be drawn in payment."

EXHIBIT E

7796 Report of the Fifth Ward Committee dated October 26, 1926, was read as follows:

"To the Mayor and City Council,

Dear Sirs:

At the last meeting of the City Council held in the Council Chamber on October 19, 1926, a communication was received from Samuel Slaff, Attorney for Peter and Rosalie Becker, stating that his clients had instructed him to start suit against the City of Clifton for damages alleged to have been done to their property at Grove and Second Street due to the surface water discharged on said land was referred to the Ward Committee.

The Ward Committee has investigated the condition and has found a just ground for complaint, not only for the above named, but for other residents also.

The Ward Committee does therefore recommend that the City take steps at an early date to extend the storm water drain from Highland Avenue to the Brook, along Third Street to the foot of Hadley Ave. and that an emergency fund be created to cause such drain to be built in order to protect the City from other property owners taking similar action.

Respectfully submitted,
(SIGNED) JACOB VAN BROEKHOVEN
(SIGNED) WM. P. JORDAN
FIFTH WARD COMMITTEE."

It was regularly moved and seconded the report be received and referred to the City Engineer. Motion carried.

The Chairman of the Sewer and Engineering Bureau Committee reported verbally on the increase in the maintenance cost of the Trunk Sewer to the effect that the increase is partly due to increased population and partly due to the connection of the 24 inch Yantacaw Trunk in the Delawanna Section, and it was regularly moved and seconded that the Chairman of the Sewer Committee be complimented for his report and that it be noted on the minutes. Motion carried.

Contract between the City of Clifton and the Van Kirk Contracting Company for retaining walls on Oak Street was received and referred to the proper officers for execution.

Upon motion regularly made, seconded and carried, the meeting then adjourned.

Respectfully submitted,

[signature]

CITY CLERK.

EXHIBIT F

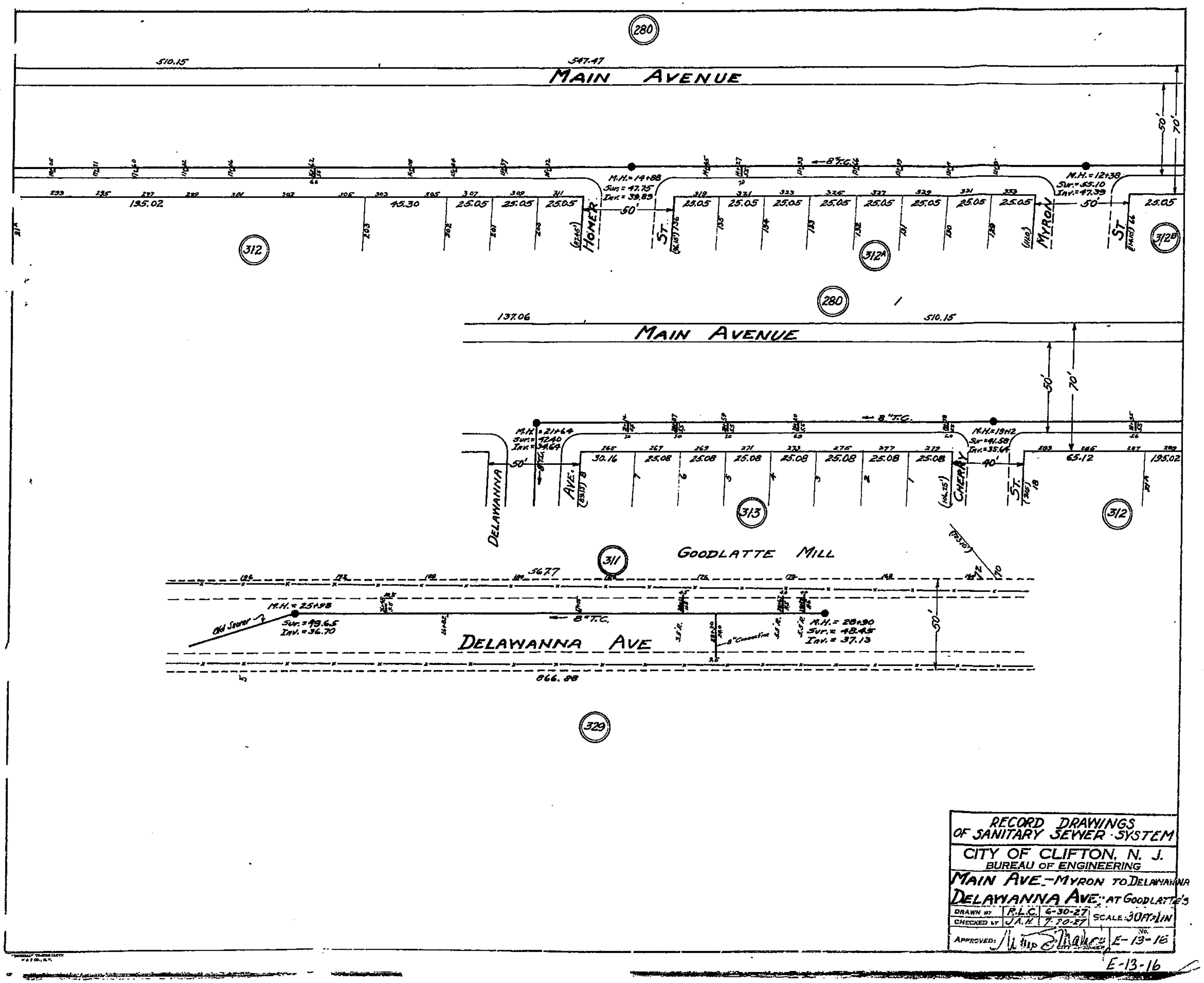
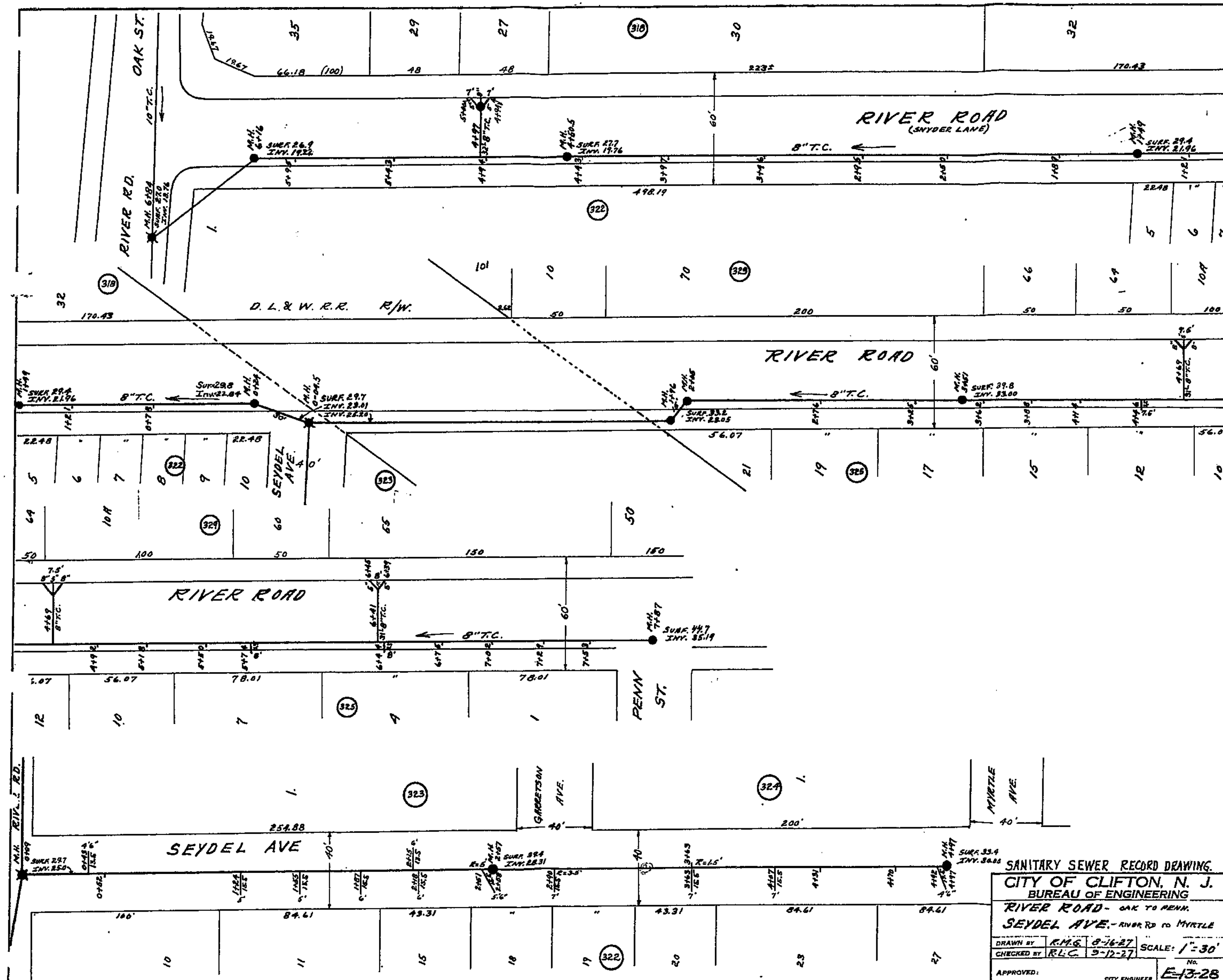

MAIN AVENUE
HOMER ST.
MYRON ST.
M.H. = 14+88
Sur. = 47.75
Inv. = 39.89
M.H. = 12+38
Sur. = 55.10
Inv. = 47.39
8" T.C.
MAIN AVENUE
DELAWANNA AVE.
CHERRY ST.
M.H. = 21+64
Sur. = 42.40
Inv. = 34.64
M.H. = 19+12
Sur. = 41.58
Inv. = 35.64
GOODLATTE MILL
DELAWANNA AVE
M.H. = 25+98
Sur. = 49.65
Inv. = 36.70
M.H. = 28+90
Sur. = 48.45
Inv. = 37.13
Old Sewer
8" Connection
RECORD DRAWINGS OF SANITARY SEWER SYSTEM
CITY OF CLIFTON, N. J.
BUREAU OF ENGINEERING
MAIN AVE.-MYRON TO DELAWANNA
DELAWANNA AVE.-AT GOODLATTE'S
DRAWN BY R.L.C. 6-30-27
CHECKED BY J.A.H. 7-20-27
SCALE: 30FT=1IN
APPROVED:
CITY ENGINEER
No. E-13-16
E-13-16

EXHIBIT G



OAK ST.
RIVER RD.
RIVER ROAD
(SNYDER LANE)
8" T.C.
D. L. & W. R.R. R/W.
RIVER ROAD
RIVER ROAD
SEYDEL AVE.
PENN ST.
GARRETSON AVE.
MYRTLE AVE.
SEYDEL AVE
SANITARY SEWER RECORD DRAWING.
CITY OF CLIFTON, N. J.
BUREAU OF ENGINEERING
RIVER ROAD - OAK TO PENN.
SEYDEL AVE. - RIVER RD TO MYRTLE
DRAWN BY R.M.G. 8-16-27
CHECKED BY R.L.C. 9-12-27
SCALE: 1" = 30'
APPROVED:
CITY ENGINEER
No. E-13-28

EXHIBIT H

#989

987.
Ord. # 989

AN ORDINANCE TO PROHIBIT THE DISCHARGE OF SEWER AND WASTE MATTER INTO THE PASSAIC RIVER OR ITS TRIBUTARIES.

****

The City of Clifton does hereby ordain:-

Section 1. No person or persons shall place or permit to be placed or discharge or permit to be discharged or cast or deposit or cause or suffer to be deposited in the Passaic River, within the limits of the City of Clifton, or into any tributary or tributaries thereof, which empty into said Passaic River, any sewage or waste matter, article or substance, liquid or solid, of any kind, which creates odors or gases or fumes, due to the putrefaction of organic matter or the presence of chemicals or which discolors the waters of said river or its tributaries, or results in the presence of oil or grease on the surface of the waters of said river, or its tributaries, or which reduces the dissolved oxygen content thereof to such an extent as to interfere with major fish life in said waters, without the permission of this Board.

Section 2. Any person violating the provisions of this ordinance shall, upon conviction thereof, be subject to a penalty of One Hundred ($100.00) Dollars plus a penalty of Twenty-five ($25.00) Dollars a day for each day that the offense shall continue.

Section 3. All ordinances or parts of ordinances inconsistent herewith or conflicting herewith are hereby repealed.

Section 4. This ordinance to take effect immediately.

Passed NOV 7 1930

Attest City Clerk Chairman of City Council

Approved Mayor

EXHIBIT I

231

#2129

F-73-1(?) 21-9-247

ORD.#2129

An Ordinance to amend "An Ordinance to amend an Ordinance entitled, 'An Ordinance requiring all buildings located upon a street in which a sewer is constructed to be connected with said sewer'".

The Municipal Council of the City of Clifton does hereby ordain:

1. That Section 1 of the above entitled ordinance be and the same is hereby amended to read as follows:

Section 1. All buildings located upon a street in which a sanitary sewer is constructed shall from and after January 1st, 1940 be connected with said sewer.

2. All ordinances or parts of ordinances inconsistent herewith be and the same are hereby repealed and this ordinance shall take effect ten (10) days after its passage and publication as provided by law.

G. McMeyer
Chairman of the Municipal Council

Passed Nov. 1st 1938

Attest [signature]
CITY CLERK

Approved [signature]
CITY MANAGER.

EXHIBIT J

AN ORDINANCE FIXING THE RATES TO BE CHARGED BY THE CITY OF CLIFTON TO THE OWNERS OR OCCUPANTS OF PROPERTY, FOR ANY SEWER CONNECTION, DIRECTLY OR INDIRECTLY WITH ITS SANITARY SEWER SYSTEM, OR OTHERWISE DISCHARGING DOMESTIC SEWAGE, COMMERCIAL AND INDUSTRIAL WASTE INTO SAID SEWER.

WHEREAS, the City of Clifton has, in order to promote the public welfare and health, provided an adequate and efficient system and means of collecting and conveying all domestic sewage, commercial and industrial waste, and

WHEREAS, the said system is connected with the sewage disposal plant of the Passaic Valley Sewerage Commissioners and by reason thereof and in accordance with the statute in such case made and provided, the City of Clifton is obligated to pay the Passaic Valley Sewerage Commissioners at a rate fixed by them, for all sewage, commercial and industrial waste passing from the City of Clifton sanitary sewer system into and through the disposal plant of the said Passaic Valley Sewerage Commissioners, and

WHEREAS, the cost assessed by the Passaic Valley Sewerage Commissioners against the City of Clifton has been heretofore paid by a tax levy upon the taxable property in such City, and

WHEREAS, after investigation, the Municipal Council is of the opinion that this method of payment by the owners and occupants of properties connected with said system is not fair and equitable ~~and that~~ a sewer rental charge ~~should be made~~ as hereinafter provided.

BE IT ORDAINED by the Municipal Council of the City of Clifton, that:

Section 1: A sewer rental charge is hereby levied and assessed against every lot, parcel of land, building or premises situate within the corporate limits of the City of Clifton, now or hereafter having any connection with the sewer system of the City of Clifton or otherwise discharging domestic sewage, commercial or industrial waste, water or other liquids either directly or indirectly into the sanitary sewer system of said City, as hereinafter provided:

(a) For any lot, parcel of land, building or premises situate within the City of Clifton, now or hereafter having any connection with the sanitary sewer system as aforesaid, where structures situated thereon are supplied with water by the Passaic Valley Water Commission or the City of Clifton distributing system, ~~a charge or charges~~, based upon a formula to be hereafter promulgated each year by the City Engineer and filed with the City Clerk of the City of Clifton; ~~said formula to be based upon~~ the actual water consumed upon said premises as shown by meter readings, at the rate charged for sewage by the Passaic Valley Sewerage Commissioners, for the year in which such sewer service or rental charge is assessed.

Approved as to Engineering

City Engineer

(b) In the event any lot, parcel of land, building, or premises discharging domestic sewage, industrial waste, water or other liquids into the sanitary sewer system of the City, either directly or indirectly, is not a user of water supplied by the Passaic Valley Water Commission, or the City of Clifton, and the water used in said building or upon said premises is not measured by any City water meter, meter of the Passaic Valley Water Commission or by a meter acceptable to the City Engineer of the said City, then in each such case the amount of water so used shall be otherwise measured or determined by the City Engineer of said City in order to determine the sewer service charge or rental provided for in subdivision "a" above, or the owner or other interested party at his own expense may install and maintain a meter acceptable to the City Engineer for said purpose.

Section 2: In the event any lot, parcel of land, building, or premises discharging domestic sewage, industrial waste, water or other liquids into the sanitary sewer system of the City, either directly or indirectly, is the user of water supplied by the Passaic Valley Water Commission or the City of Clifton in whole, or is partly supplied by the Passaic Valley Water Commission or the City of Clifton and other water not measured by a City water meter or a water meter of the Passaic Valley Water Commission, and the discharge of sewage, industrial waste, water or other liquids into the said sanitary sewer amounts to 500,000 gallons or more per day (a day being a twenty-four hour day), or such discharge is estimated by the City Engineer of said City to be 500,000 gallons or more per day, the owner, occupant or other person interested shall, at his, their or its expense, install and maintain such meter or meters as shall be acceptable to the City Engineer for said purpose.

Section 3: Each lot, plot, parcel of land or premises affected by this ordinance shall receive the following credit or allowance on account of gallonage computed as aforesaid and the sewer service or rental charges assessed in accordance with this ordinance shall be based on the number of gallons discharged into such sanitary sewer system after giving effect to allowances hereinafter provided for:

(a) 90,000 gallons per year for each separate housekeeping unit in a residential building now or hereafter erected or placed upon any lot, plot or premises, having any connection with the sanitary sewer system or otherwise discharging domestic sewage, waste, water or other liquids either directly or indirectly into the said sanitary sewer system, where such building contains only one housekeeping unit.

(b) 180,000 gallons per year for two housekeeping units in a residential building now or hereafter erected or placed upon any lot, plot or premises having any connection with the sanitary sewer system or otherwise discharging domestic sewage, waste, water or other liquids either directly or indirectly into the said sanitary sewer system, where such building contains not more than two housekeeping units.

25kk

(c) 50,000 gallons per year for each housekeeping unit in a residential building now or hereafter erected or placed upon any lot, plot or premises having any connection with the sanitary sewer system or otherwise discharging domestic sewage, industrial waste, water or other liquids either directly or indirectly into the said sanitary sewer system, where such building is a multiple family dwelling having more than two housekeeping units therein.

conducted in any building or structure

(d) 100,000 gallons per day for each place of business situate upon any lot, plot, parcel of land having any connection with the sanitary sewer system or otherwise discharging domestic sewage, industrial waste, water or other liquids either directly or indirectly into the said sanitary sewer system. Where the term "place of business" is used in this subdivision, it shall be intended to mean any business permitted by the zoning ordinances of the City of Clifton, in any business zone therein, as the same are now in effect or hereafter amended or supplemented. In the event that any such lot, plot or parcel of land so connected to the sanitary sewer system, as aforesaid, has or shall hereafter have erected thereon a building or structure used or intended for use as a place of business and for dwellings having separate housekeeping units, the provisions of this subdivision and that of subdivisions "a" or "b" above shall be applicable to such property.

conducted in any building or structure

(e) 1,000,000 gallons per day for any place of industry situate upon any lot, plot, parcel of land having any connection with the sanitary sewer system or otherwise discharging domestic sewage, industrial waste, water or other liquids either directly or indirectly into the said sanitary sewer system. Where the term "place of industry" is used in this subdivision it shall be intended to mean any industry permitted by the zoning ordinances of the City of Clifton, in any industrial zone therein, as the same are now in effect or hereafter amended or supplemented.

Section 4: All lots, lands, buildings or premises located within the limits of the City of Clifton and owned and used by the Board of Education of the City of Clifton, in the County of Passaic, for school purposes, and by the City of Clifton, are hereby exempt from said sewer service charge or rental.

Section 5: For any lot, land, building or premises from which connection is made with the sanitary sewer system of the City, or which begins to discharge domestic sewage, industrial waste, water or other liquids into said sanitary sewer system, either directly or indirectly, after this ordinance becomes effective, a charge shall be made pursuant to this ordinance, the same to be a per diem pro rata amount based upon the actual or estimated water consumption as hereinbefore provided for a period of three months prior to the date such sewer connection is made, or such discharge into such sanitary sewer system, either directly or indirectly is begun, until the next following quarter period, and allowances herein above provided shall be made upon the same bases.

252|31

Section 6: The sewer service or rental charge levied and assessed by this ordinance shall be payable in four quarterly payments in each year, at the office of the Tax Collector of the City of Clifton, at the same time as water bills are payable. Interest at the rate of 6% per annum shall be charged thereon if payment is not made within ten days after the date of each bill or statement, under this ordinance, is rendered.

Section 7: The City Engineer of the City of Clifton or any duly authorized agent of said City shall have access to any and all premises now or hereafter connected with the sanitary sewer system or otherwise discharging domestic sewage, industrial waste, water or other liquids either directly or indirectly into the sanitary sewer system of the City of Clifton, within reasonable hours, for the purpose of making inspection thereof and reading any meter or meters connected therewith.

Section 8: Each charge or rental levied by or pursuant to this ordinance shall be a lien upon the lot, plot or parcel of land served by any connection to the sanitary sewer system of the City of Clifton, until paid, and such charges or rentals, together with interest, costs and penalties, shall be collected in the same manner as by law is provided for the collection of taxes upon real estate.

Section 9: All ordinances or parts or ordinances inconsistent herewith are hereby repealed as to such inconsistency only.

Section 10: This ordinance shall take effect ten days after publication and final passage as provided for by law.

Passed: JUL 5 1939

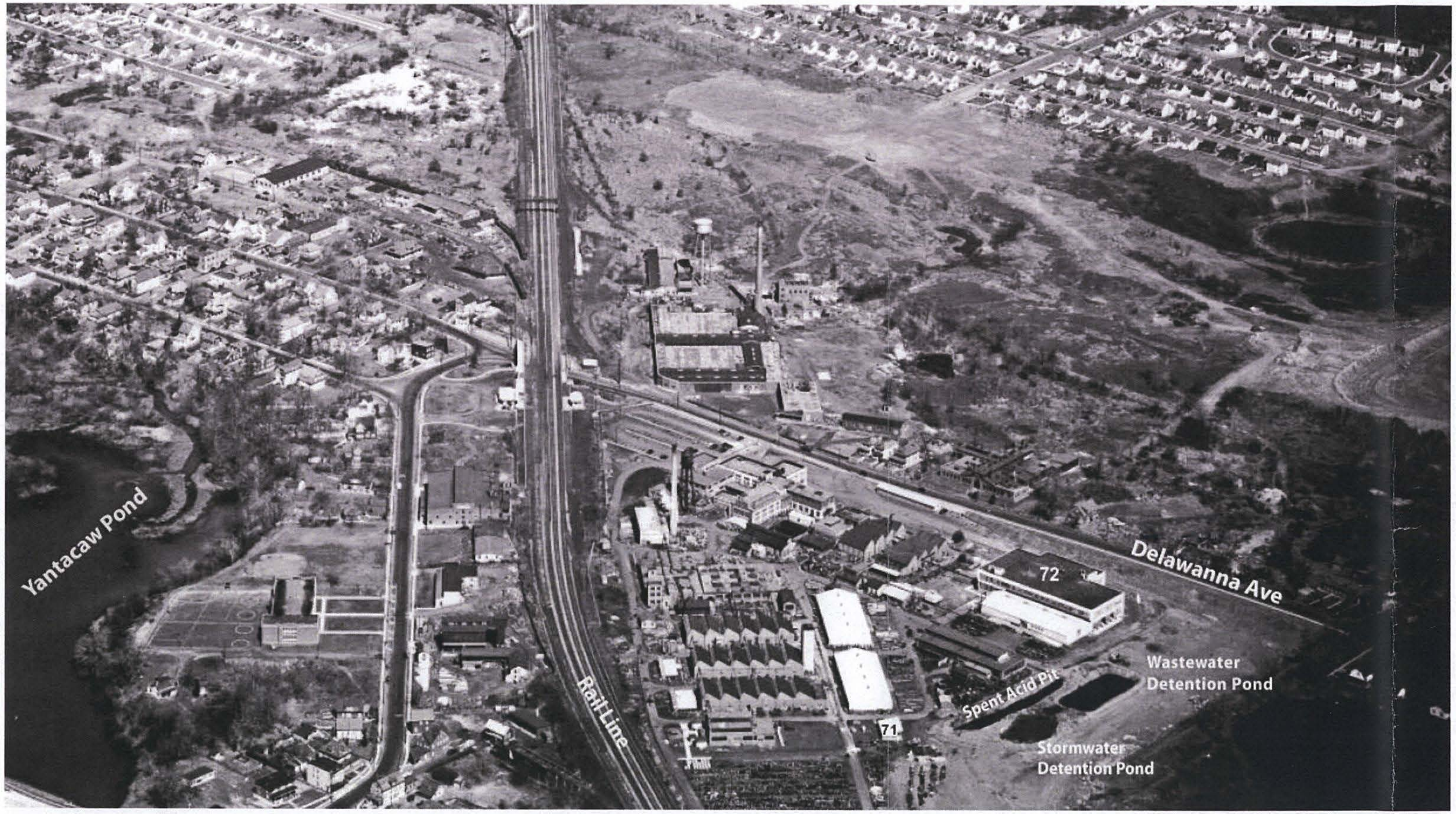
[signature]
Chairman of the Municipal Council

Attest: [signature]
City Clerk

Approved: [signature]
City Manager

253/41

EXHIBIT K



Notes:
Oblique perspective facing north

Data Source:
490404_PFAIR001_103357

1949 Oblique Aerial Imagery	Exhibit
Givaudan - Passaic Clifton, NJ	12

1949 - Oblique

Observed Photograph Features

- Paving noted in parking areas in northern portion of site and potential travel lanes throughout site.
- A building has been constructed between an existing building and Delawanna Avenue in the eastern portion of the property.
- Increased outside storage in several areas of the site, nearby site buildings.
- Three surface water impoundments evident and containing water/liquids.
- The Stormwater Detention Pond, the Spent Acid Pit, and the Wastewater Detention Pond appear to be local depressions with defined embankments/berms as sidewalls.
- No channelized flow or surface drainage features noted on site.
- A larger area surrounding the impoundments has been leveled/excavated.
- An embankment is visible between the leveled area near the surface impoundments and Delawanna Avenue, which is topographically elevated.
- Substantial terrain variations and water features noted to the northeast of the site with a significant increase in residential development beyond.

Site Development Notes

- Building 71 constructed southeast of process buildings for storage of cylinders and Building 72 constructed in 1949 and primarily used for office and storage adjacent to Delawanna Avenue in the eastern portion of the site (FMED, 1972).
- A handwritten note from June 1949 on a 1920 well log for a Givaudan water supply well indicates that according to the well driller (A.F. Rimbrand), there are 5 wells at the Delawanna plant and that waste is dumped into pits adjacent to the plant (Rimbrand, 1920 with June 15, 1949 note from H.H.).

EXHIBIT L

LHW 4/20/51-6c.

Rey 2010 5/1/51

#2631

AN ORDINANCE TO AUTHORIZE THE CONSTRUCTION OF A SANITARY TRUNK SEWER FROM THE INTERSECTION OF KINGSLAND AVENUE AND YANTACAW STREET TO A POINT IN THE STATE HIGHWAY S-3 RIGHT-OF-WAY NEAR TRAP ROCK DRIVE, AND TO AUTHORIZE THE ISSUANCE OF BONDS AND BOND ANTICIPATION NOTES TO FINANCE THE COST THEREOF.

BE IT ORDAINED by the City Council of the City of Clifton, as follows:

Section 1. For the purpose of enlarging and extending the sanitary sewer system maintained by the City of Clifton, said City shall construct a sanitary trunk sewer thirty inches in diameter from an existing manhole in Yancataw Street near its intersection with Kingsland Avenue to a point in New Jersey State Highway S-3 right-of-way approximately one hundred fifty feet to the east of the intersection of such right-of-way with Trap Rock Drive, and shall also construct the manholes and other appurtenances necessary or suitable for the operation of such sanitary sewer. Said improvement shall be constructed in accordance with plans and profiles entitled "Plan and Profile: Yancataw Trunk Sewer" dated April 2, 1951, prepared and approved by the City Engineer, a copy of which has been filed in the office of the City Clerk. In order to provide for the construction of such sanitary sewer, manholes and other appurtenances, there shall be acquired, either by purchase or condemnation, in accordance with law, the following easements or rights-of-way:

W (5)

First Tract

Being a strip of land fifteen (15) feet in width, said lands include all the land ten (10) feet easterly and five (5) feet westerly of the center line described as follows:

Beginning at a point on the northerly side of Kingsland Avenue distant 50 feet on a course of N. 64° 06' W. from an angle in said Kingsland Road, and running thence (1) N. 28° W, ninety more or less (90 ∕) feet; thence (2) N. 51° 34' W three hundred sixty three more or less (363 ∕) feet; thence (3) N. 36° 14' W two hundred ten mor or less (210 ∕) feet to the easterly side of Lot 5 in Block 319, as shown on the Assessment Maps of the City of Clifton.

Being Easement No. I through Block 319, Lot 15 as shown on the Assessment Maps of the City of Clifton.

Second Tract

Being a strip of land fifteen (15) feet in width, said lands include all the land ten (10) feet easterly and five (5) feet westerly of the center line described as follows:

Beginning at a point in the easterly side of lot 5 in block 319 as shown on the Assessment Maps of the City of Clifton said point being distant 110 ∕ feet southerly from an angle in said lot 5 and running thence (1) N. 36° 14' W thirty eight more or less (38 ∕) feet; thence (2) N. 10° 12' W seventy six more or less (76 ∕) feet; thence (3) N. 9° 12' W, forty six more or less (46 ∕) feet to the center of the Third River and the easterly side of lot 3 in block 319.

Being Easement No. 2 through Block 319, Lot 5, as shown on the Assessment Maps of the City of Clifton.

Third Tract

Being a strip of land fifteen (15) feet in width, said lands include all the land ten (10) feet easterly and five (5) feet westerly of the center line described as follows:

Beginning at a point in the easterly side of Lot 3 in Block 319 as shown on the Assessment Maps of the City of Clifton, said point being distant 100 ∕ feet northerly from the easterly corner of lot 3 and running thence (1) N. 9° 12' W , sixty four more or less (64 ∕) feet; thence (2) N. 9° 00' W one hundred thirty three more or less (133 ∕) feet to the southerly line of lot 5 in block 319.

Being Easement No. 3 through Block 319, Lot 3, as shown on the Assessment Maps of the City of Clifton.

Fourth Tract

Being a strip of land fifteen (15) feet in width, said lands include all the land ten (10) feet easterly and five feet wester ly of the center line described as follows:

Beginning at a point on the southerly line of lot 5 in block 319 as shown on the Assessment Maps of the City of Clifton, saic point being distant 180 ∕ feet from the easterly side of River Road and running thence (1) N. 9° 00' W. two hundred sixty four more or les (264 ∕) feet which point is distant 220 ∕ feet northerly measured alo the easterly side of River Road from the southerly line of lot 5.

Being Easement No. 4 through Block 319, Lot 5, as shown on the Assessment Maps of the City of Clifton.

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Fifth Tract

Being a strip of land ten (10) feet in width, the westerly side of which is described as follows:

Beginning at a point on the easterly side of River Road distant 220 ± feet, more or less northerly from the southerly line of lot 5 in block 319 as shown on the Assessment Maps of the City of Clifton and running thence (1) Northerly along the easterly side of River Road, the various courses thereof one hundred forty five more or less (145 ±) feet.

Being Easement No. 5 through Block 319, Lots 5 [illegible], as shown on the Assessment Maps of the City of Clifton.

Sixth Tract

Being a strip of land five (5) feet in width, the westerly side of Which is described as follows:

Beginning at a point on the westerly side of River Road distant 230 ± feet northerly from the northerly side of lot 230 in block 315 as shown on the Assessment Maps of the City of Clifton and running thence (1) N. 30° 09' W one hundred eighty seven more or less (187 ±) feet to a point distant 10 feet easterly from a cyclone fence; thence (2) N. 29° 07' W parallel with said fence and 10 feet easterly therefrom three hundred forty more or less (340 ±) feet; thence (3) N. 18° 37' W still parallel with said fence two hundred eighty eight more or less (288 ±) feet; thence (4) N. 27° 45' W still parallel with said fence one hundred thirty six more or less (136 ±) feet, thence (5) N. 33° 05' W still parallel with said fence two hundred sixty five more or less (265 ±) feet, thence (6) N. 35° 14' W still parallel with said fence forty seven more or less (47 ±) feet to the southerly R.O.W. line of N.J. State Highway Route S-3.

Being Easement No. 6 through Block 315, Lots 245 and 246, as shown on the Assessment Maps of the City of Clifton.

Seventh Tract

Being a strip of land five (5) feet in width, the westerly side of which is described as follows:

Beginning at a point on the southerly R.O.W. line of State Highway S-3 said point being distant (41 ±) feet easterly measured along said R.O.W. from the easterly side of lot 230 in block 315 as shown on the Assessment Maps of the City of Clifton said point is also distant (10 ±) more or less feet measured at right angles from an iron fence running along lot 230 and running thence (1) N. 35° 14' W. eighty six more or less (86 ±) feet to a point distant 20 more or less feet easterly from said R.O.W. line; thence (2) N. 53° 37' W. two hundred seven more or less (207 ±) feet to a point which is distant 10 more or less feet from the said R.O.W. line; thence (3) N. 50° 07' W. parallel or nearly so with said R. O. W. line and 10 more or less feet easterly therefrom two hundred seventy one more or less (271 ±) feet; thence (4) N. 50° 11' W. parallel or nearly so with said R.O.W. line two hundred seventy six more or less (276 ±) feet.

Being Easement No. 7 through N. J. State Highway S-3 as shown on the Assessment Maps of the City of Clifton.

Said easements referred to are shown upon map entitled, "Plan and profile; Yantacaw Trunk Sewer, John L. Fitzgerald, City Engineer, City of Clifton, N. J., Bureau of Engineering, No. E-13-416."

Section 2. It is hereby determined and stated that (1) the making of such improvement (hereinafter referred to as "purpose") is not a current expense of said City and (2) it is necessary to finance said purpose by the issuance of obligations of said City pursuant to the Local Bond Law of New Jersey and (3) the estimated amount of money necessary to be raised from all sources for said purpose is $150,000 and (4) $ $7,500 of said sum is to be provided by the down payment hereinafter appropriated to finance said purpose and (5) the estimated maximum amount of bonds or notes necessary to be issued for said purpose is $ 142,500 and (6) the cost of such purpose, as hereinbefore stated, includes the sum of $10,000 00/100, which is estimated to be necessary to finance (a) engineering and inspection costs and legal expenses and (b) the cost of issuing the obligations authorized by this ordinance and (c) interest on such obligations, to the extent permitted by Section 40:1-55 of said Local Bond Law, and (7) no part of the cost of said improvement is to be specially assessed upon property specially benefitted.

Section 3. It is hereby determined and stated that moneys exceeding $ 7,500, appropriated for down payments on capital improvements or for the capital improvement fund in budgets heretofore adopted for said City are now available to finance said purpose. The sum of $ 7,500 is hereby appropriated from such moneys to the payment of the cost of said purpose.

Section 4. To finance said purpose, bonds of said City of an aggregate principal amount not exceeding $142,500 are hereby authorized to be issued pursuant to said Local Bond Law. Said bonds shall bear interest at a rate which shall not exceed six per centum (6%) per annum. All matters with respect to said bonds not determined by this ordinance shall be determined by resolutions to be hereafter adopted.

Section 5. To finance said purpose, Bond Anticipation Notes of said City of an aggregate principal amount not

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exceeding $ 142,500 are hereby authorized to be issued pursuant to said Local Bond Law, in anticipation of the issuance of said bonds. Said notes shall bear interest at a rate which shall not exceed six per centum (6%) per annum, and may be renewed from time to time pursuant to and within the limitations prescribed by said Law. All matters with respect to said notes not determined by this ordinance shall be determined by resolutions to be hereafter adopted. In the event that bonds are issued pursuant to this ordinance, the aggregate amount of notes hereby authorized to be issued shall be reduced by an amount equal to the principal amount of the bonds so issued. If the aggregate amount of outstanding bonds and notes issued pursuant to this ordinance shall at any time exceed the sum first mentioned in this section, the moneys raised by the issuance of said bonds shall, to not less than the amount of such excess, be applied to the payment of such notes then outstanding.

Section 6. It is hereby determined and declared that the period of usefulness of said purpose, according to its reasonable life, is a period of forty years computed from the date of said bonds.

Section 7. It is hereby determined and stated that the Supplemental Debt Statement required by said Local Bond Law has been duly made and filed in the office of the City Clerk of said City, and that such statement so filed shows that the gross debt of said City, as defined in Section 40:1-76 of said Local Bond Law, is increased by this ordinance by $ 142,500, and that the bonds and notes authorized by this ordinance will be within all debt limitations prescribed by said Local Bond Law.

Section 8. This ordinance shall take effect twenty days after the first publication thereof after final passage.

Passed: MAY 15 1951

Attest: Edith M. Marion, Acting City Clerk — Chairman of the Municipal Council

Approved: Acting City Manager

EXHIBIT M

122

#2671

9-17-277

#2671

AN ORDINANCE TO AUTHORIZE THE CONSTRUCTION OF SANITARY SEWERS WITH SUITABLE APPURTENANCES, AS A LOCAL IMPROVEMENT, IN RIVER ROAD AND LOWER RIVER DRIVE, AND TO AUTHORIZE THE ISSUANCE OF BONDS AND BOND ANTICIPATION NOTES TO FINANCE THE COST OF SUCH IMPROVEMENTS.

BE IT ORDAINED by the City Council of the City of Clifton as follows:

Section 1. Sanitary sewers, together with the manholes, weir chambers and other appurtenances necessary or suitable for the operation of such sanitary sewers, shall be constructed in and along Lower River Drive from a point in its intersection with River Road in a southerly direction for a distance approximately 600 feet and in and along River Road from a point 520 feet to the south of its intersection with Lower River Drive in a northerly direction for a distance of approximately 4050 feet, and such sanitary sewers shall be connected with the trunk sewer maintained and operated by the Passaic Valley Sewerage Commission and located in a right-of-way to the east of River Road by constructing in easements or rights-of-way to be acquired for such purpose two sewers suitable to connect such sanitary sewers with such trunk sewer. House connections extending from such sanitary sewers to the curb line shall be constructed at the locations indicated on the plan and profile hereinafter referred to. Such improvement shall be constructed in accordance with plan and profile entitled, "Plan and Profile: River Rd. San. Sewer", dated December 26, 1950 and consisting of eight sheets numbered from E-13-412A to E-13-412H, inc., prepared by the City Engineer, a copy of which has been filed in the office of the City Clerk.

Section 2. In order to provide for the construction of said two sanitary sewers which are to be constructed in order to connect said sewers in Lower River Drive and in River Road with

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said trunk sewer maintained and operated by the Passaic Valley Sew erage Commission, the City of Clifton shall acquire, either by purchase or condemnation, in accordance with law, the easements or rights-of way, the locations and dimensions of which are shown in detail on the map which accompanies this ordinance. Said easements or rights-of way shall consist of easements ten feet in width along the following three strips of land:

FIRST TRACT: Being a strip of land ten (10) feet in width the center line of which is described as follows:

BEGINNING at a point on the easterly line of River Road distant twenty six more or less (26±) feet southerly from the intersection of the easterly line of River Road and the division line of lots 45 and 45A in Block 330 as shown on the Assessment Maps of the City of Clifton and running thence (1) Easterly and nearly parallel with said division line one hundred twenty four more or less (124±) feet to the Passaic Valley Sewer Commissions manhole at station 42 + 25.

BEING further known on Map of "River Road Sanitary Sewer" on file in the Engineering Bureau of the City of Clifton, N. J. as Map #E-13-412G and A-5-112.

This easement contains one thousand two hundred forty more or less (1240 ±) square feet.

SECOND TRACT: Being a strip of land ten (10) feet in width the center line of which is described as follows:

BEGINNING at a point on the division line of lots 60 and 60A in Block 327A as shown on the Assessment Maps of the City of Clifton, said point also being fifty five more or less (55 ±) 110± westerly from the westerly line of Lower River Drive and running thence (1) Southwesterly, fifty seven more or less (57±) feet to a Passaic Valley Sanitary Sewer Manhole at station 19 + 0.

BEING further shown and designated on Map of "Lower River Drive Sanitary Sewer", on file in the Engineering Bureau of the City of Clifton, N. J., as Map #E-13-412F and A-5-112.

This easement contains five hundred seventy more or less (570 ±) square feet.

THIRD TRACT: Being a strip of land ten (10) feet in width the center line of which is described as follows:

BEGINNING at a point on the westerly line of lower River Drive distant sixty seven more or less (67 ±) feet southerly from the intersection of the division line of Lots 65 and 60 in Block 327A as shown on the Assessment Maps of the City of Clifton, and the westerly line of Lower River Drive and running thence (1) Southwesterly, fifty four more or less (54±) feet to the division line of lots 60 and 50A in Block 327A said point also being fifty five more or less (55 ±) feet westerly along the said division line from the westerly line of Lower River Drive.

BEING further shown and designated on map of "Lower River Drive Sanitary Sewer" on file in the Engineering Bureau of the City of Clifton, N. J. as Map #E-13-412F and A-5-112.

This easement contains five hundred forty more or less (540 ±) square feet.

Section 3. Said improvement shall be undertaken as a local improvement and the cost thereof not borne by the City shall be assessed upon the lands and real estate upon the line and in the vicinity of said improvement which may be benefited by said improvement, as provided in Chapter 56 of Title 40 of the Revised Statutes of New Jersey. All assessments levied for said improvement shall in each case be as nearly as may be in proportion to and not in excess of the peculiar benefit, advantage or increase in value which the respective lots and parcels of real estate shall be deemed to receive by reason of such improvement. The total amount of the assessments so levied shall not exceed the cost of said improvement. The portion of such cost which shall not

3

be so assessed shall be paid by the City as in the case of a general improvement which is to be paid for by general taxation.

Section 4. It is hereby determined and stated that (1) the City will contribute no part of the cost of said purpose, it being expected that the special assessments levied therefor will equal $88,000.00 and (2) no special assessments for such purpose have been levied or confirmed and (3) such special assessments may be paid in 10 installments.

Section 5. It is hereby determined and stated that (1) the making of such improvement (hereinafter referred to as "purpose") is not a current expense of said City and (2) it is necessary to finance said purpose by the issuance of obligations of said City pursuant to the Local Bond Law of New Jersey and (3) the estimated amount of money necessary to be raised from all sources for said purpose is $88,000.00 and (4) $4,400.00 of said sum is to be provided by the down payment hereinafter appropriated to finance said purpose and (5) the estimated maximum amount of bonds or notes necessary to be issued for said purpose is $83,600.00 and (6) the cost of said purpose, as hereinbefore stated, includes the sum of $4,400.00, which is estimated to be necessary to finance (a) engineering and inspection costs and legal expenses and (b) the cost of issuing the obligations authorized by this ordinance and (c) interest on such obligations, to the extent permitted by Section 40:1-55 of said Local Bond Law.

Section 6. It is hereby determined and stated that moneys exceeding $4,400.00 , appropriated for down payments on capital. improvements or for the capital improvement fund in budgets heretofore adopted for said City are now available to finance said purpose. The sum of $4,400.00 is hereby appropriated from such moneys to the payment of the cost of said purpose.

Section 7. To finance said purpose, bonds of said City of an aggregate principal amount not exceeding $83,600.00

-4-

are hereby authorized to be issued pursuant to said Local Bond Law. Said bonds shall bear interest at a rate which shall not exceed six per centum (6%) per annum. All matters with respect to said bonds not determined by this ordinance shall be determined by resolutions to be hereafter adopted.

Section 8. To finance said purpose, Bond Anticipation Notes of said City of an aggregate principal amount not exceeding $83,600.00 are hereby authorized to be issued pursuant to said Local Bond Law, in anticipation of the issuance of said bonds. Said notes shall bear interest at a rate which shall not exceed six per centum (6%) per annum, and may be renewed from time to time pursuant to and within the limitations prescribed by said Law. All matters with respect to said notes not determined by this ordinance shall be determined by resolutions to be hereafter adopted. In the event that bonds are issued pursuant to this ordinance, the aggregate amount of notes hereby authorized to be issued shall be reduced by an amount equal to the principal amount of the bonds so issued. If the aggregate amount of outstanding bonds and notes issued pursuant to this ordinance shall at any time exceed the sum first mentioned in this section, the moneys raised by the issuance of said bonds shall, to not less than the amount of such excess, be applied to the payment of such notes then outstanding.

Section 9. It is hereby determined and declared that the period of usefulness of said purpose, according to its reasonable life, is a period of forty years computed from the date of said bonds.

Section 10. It is hereby determined and stated that the Supplemental Debt Statement required by said Local Bond Law has been duly made and filed in the office of the City Clerk of said City, and that such statement so filed shows that the gross debt of said City, as defined in Section 40:1-76 of said

Local Bond Law, is increased by this ordinance by $83,600.00, and that the bonds and notes authorized by this ordinance will be within all debt limitations prescribed by said Local Bond Law.

Section 11. This ordinance shall take effect twenty days after the first publication thereof after final passage.

Passed: NOV 20 1951

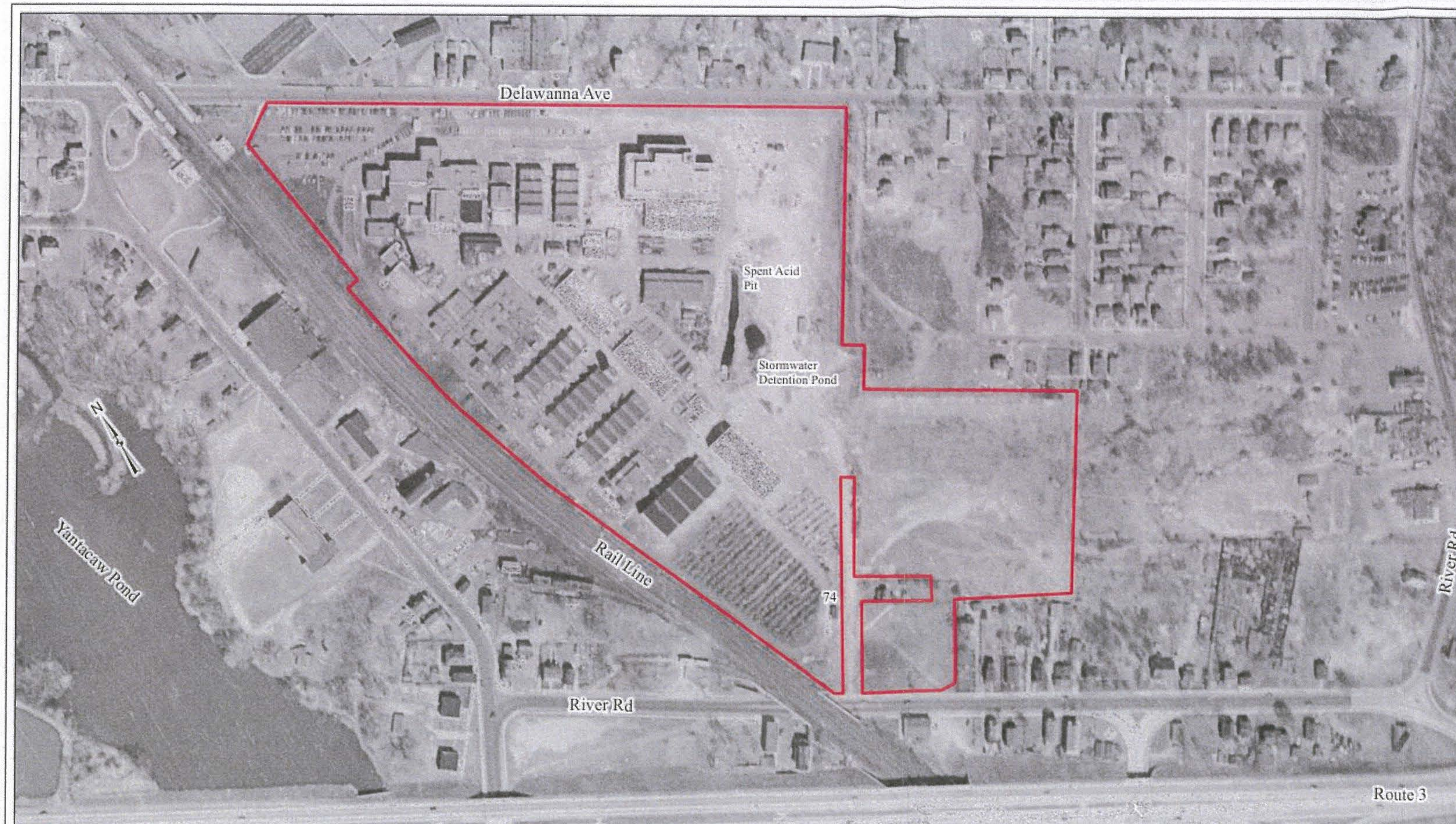
Fred G. DeVido
Chairman of the Municipal Council

Attest: [signature]
City Clerk

Approved: [signature]
City Manager

-6-

EXHIBIT N



Site Boundary

0 100 200 400 Feet

1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this boundary.

DATA SOURCES:
1951 Aerial: 510407-289-2672
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1951 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	14

1951 – Site View

Observed Photograph Features

- Buildings constructed south of Process Area.
- Outside storage in several areas of the site.
- Rectangular surface impoundment (Wastewater Detention Pond) is no longer present and the area appears to have been re-graded.
- No channelized flow or surface drainage features noted on site.
- Significant clearing/excavation of land in the southernmost areas of the site.

Site Development Notes

- From 1950 to 1987, groundwater was continuously extracted and used a non-contact cooling water (~1 million gallons/week) then discharged to the PVSC (ERM, 2000).
- An August 27, 1951 report by Dr. G.C. Kitchens details the process for recovery of G-11 from sediment that "has collected in the pond, which was a part of our old sewer system". The letter indicates that samples of the sediment from the pond have been found to consist principally of G-11 (60%) and inorganic matter. The G-11 can be easily recovered as G-11 Pure by solvent or caustic extraction.
- The 1951 Sanborn Map indicates the former manufacturing facility north of Delawanna Avenue is owned by Hoffman-LaRoche Company, Inc. (Sanborn Library, LLC, 1951).

EXHIBIT O

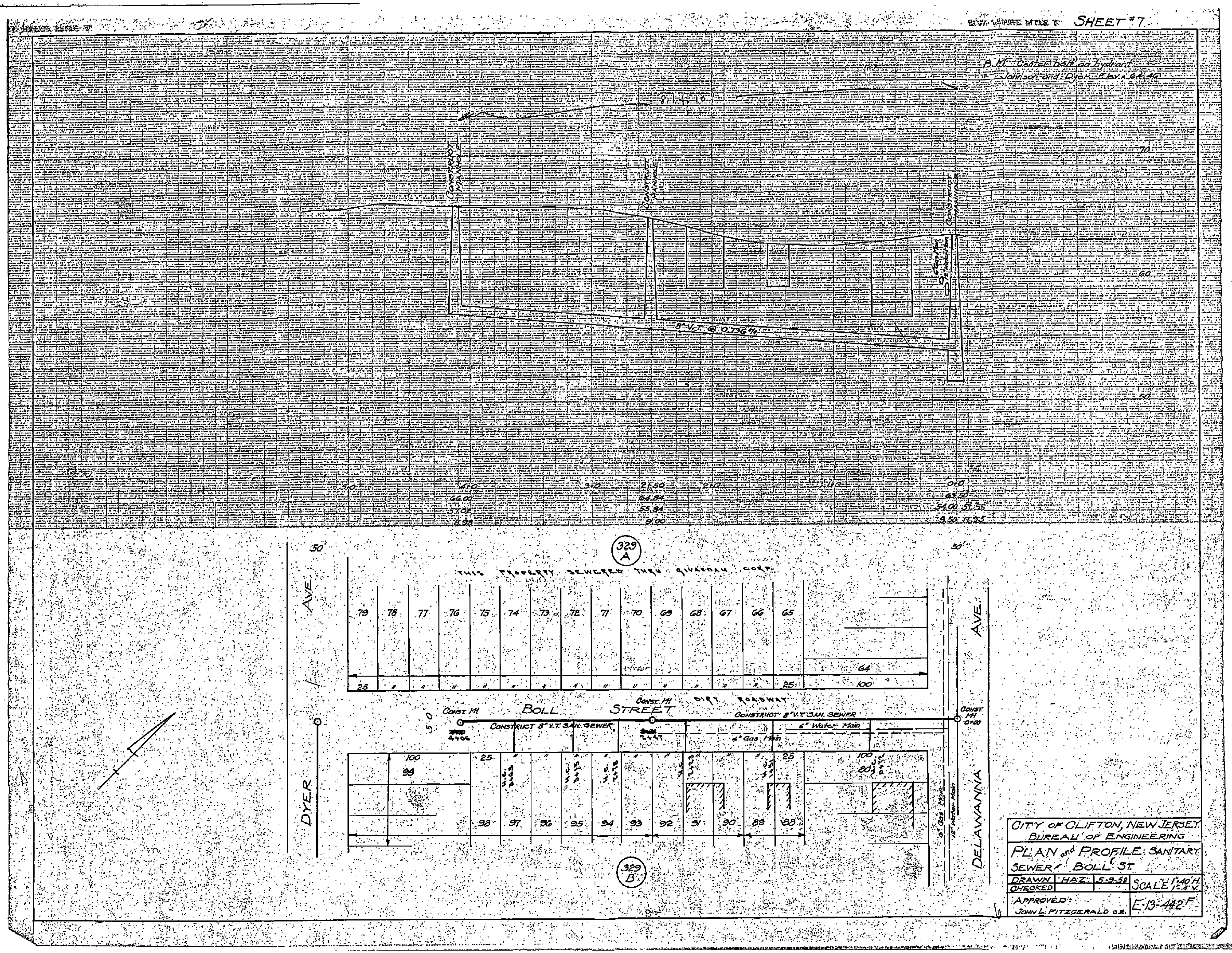

SHEET #7
B.M. - Center bolt on hydrant Johnson and Dyer - Elev. = 64.40
CONSTRUCT MANHOLE
CONSTRUCT MANHOLE
CONSTRUCT MANHOLE
8" V.T. @ 0.736%
70
60
50
329 A
THIS PROPERTY SEWERED THRU RIVERDAN CORP.
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
64
25
100
DYER AVE.
DELAWANNA AVE.
BOLL STREET
DIRT ROADWAY
CONST. MH
CONSTRUCT 8" V.T. SAN. SEWER
6" Water Main
4" Gas Main
99
80
98
97
96
95
94
93
92
91
90
89
88
12" Water Main
329 B
CITY OF CLIFTON, NEW JERSEY
BUREAU OF ENGINEERING
PLAN and PROFILE: SANITARY SEWER / BOLL ST.
DRAWN HAZ. 5-9-52
CHECKED
SCALE 1"=40' H, 1"=4' V.
APPROVED:
JOHN L. FITZGERALD C.E.
E-13-442 F

EXHIBIT P

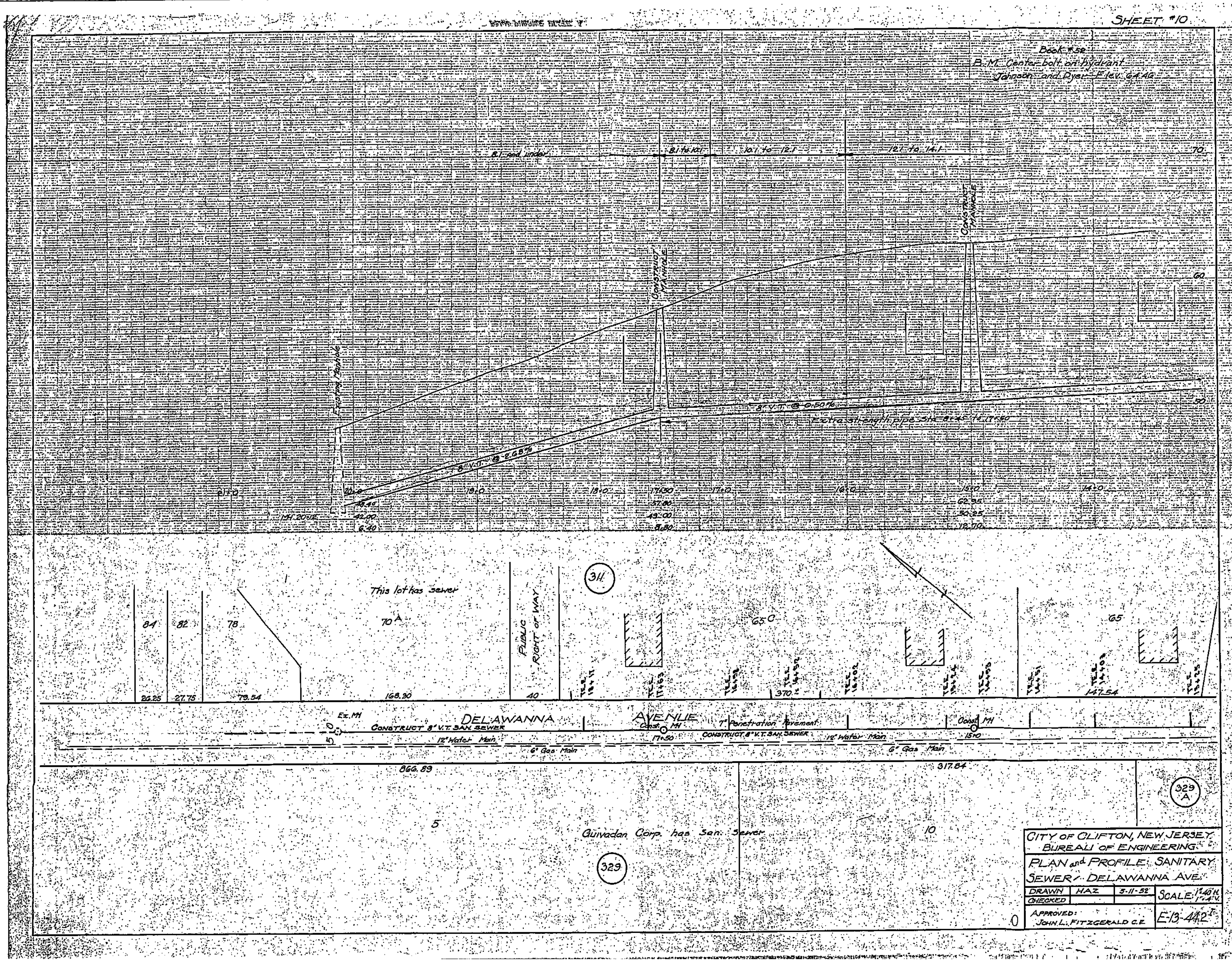

SHEET #10
Book #52
B.M. Center bolt on hydrant
Johnson and Ryer Elev. 64.46
8.1 and under
8.1 to 10.1
10.1 to 12.1
12.1 to 14.1
70
60
50
Existing Manhole
Construct Manhole
Construct Manhole
8" V.T. @ 2.65%
8" V.T. @ 0.50%
Extra strength pipe
20+0
19+0
18+0
17+50
17+0
16+0
15+0
14+0
This lot has sewer
84
82
78
70A
PUBLIC RIGHT OF WAY
311
65C
65
26.25
27.75
73.54
168.30
40
370
147.54
DELAWANNA AVENUE
Ex. MH
CONSTRUCT 8" V.T. SAN. SEWER
Const. MH
7" Penetration Pavement
CONSTRUCT 8" V.T. SAN. SEWER
Const. MH
12" Water Main
6" Gas Main
866.89
317.84
329 A
5
Guivadan Corp. has San. Sewer
10
329
CITY OF CLIFTON, NEW JERSEY
BUREAU OF ENGINEERING
PLAN and PROFILE: SANITARY SEWER - DELAWANNA AVE.
DRAWN HAZ 5-11-52
CHECKED
SCALE: 1"=40' H. 1"=4' V.
APPROVED: JOHN L. FITZGERALD C.E.
E-13-442 I

EXHIBIT Q

#2716

AN ORDINANCE TO AUTHORIZE THE CONSTRUCTION OF A SANITARY SEWER WITH SUITABLE APPURTENANCES AS A LOCAL IMPROVEMENT IN DYER AVENUE, JEFFERSON STREET, JOHNSON STREET, WICKERS STREET, WHEELER STREET, BOLL STREET, DELAWANNA AVENUE AND NETTIE PLACE, AND TO AUTHORIZE THE ISSUANCE OF BONDS TO FINANCE THE COST THEREOF, AND TO PROVIDE FOR THE ISSUANCE OF BOND ANTICIPATION NOTES IN ANTICIPATION OF THE ISSUANCE OF SUCH BONDS.

BE IT ORDAINED by the City Council of the City of Clifton, as follows:

Section 1. Sanitary sewers, eight inches in diamater, to be connected with the sanitary sewer system maintained by the City of Clifton, together with the manholes and other appurtenances and house connections to the curb line necessary or suitable for the operation of such sanitary sewers, shall be constructed in and along the following public highways: (1) Dyer Avenue from its intersection with River Road to its intersection with Boll Street; (2) Jefferson Street from its intersection with Dyer Avenue to a point approximately 75 feet to the west of its intersection with Delawanna Avenue; (3) Johnson Street from its intersection with Dyer Avenue to a point approximately 135 feet to the west of its intersection with Delawanna Avenue; (4) Wickers Street from its intersection with Dyer Avenue to a point approximately 125 feet to the west of its intersection with Delawanna Avenue; (5) Wheeler Street from its intersection with Delawanna Avenue to a point approximately 125 feet to the east of its intersection with Dyer Avenue; (6) Boll Street from its intersection with Delawanna Avenue to a point approximately 90 feet to the east of its intersection with Dyer Avenue; (7) Delawanna Avenue from its intersection with River Road to a point approximately 740 feet to the west of its intersection with Boll Street, and (8) Nettie Place from its intersection with

Delawanna Avenue in a northerly direction for a distance of approximately 350 feet. Such improvement shall be constructed in accordance with plans and profiles consisting of one sheet numbered E-13-442 dated May 7, 1952, three sheets numbered E-13-442A, E-13-442B and E-13-442C dated May 8, 1952, four sheets numbered E-13-442E, E-13-442F, E-13-442G, E-13-442H dated May 9, 1952, and two sheets numbered E-13-442I and E-13-442J, dated May 11, 1952, prepared by the City Engineer, copies of which sheets have been filed in the office of the City Clerk.

Section 2. Said improvement shall be undertaken as a local improvement and the cost thereof not borne by the City shall be assessed upon the lands and real estate upon the line and in the vicinity of said improvement which may be benefited by said improvement, as provided in Chapter 56 of Title 40 of the Revised Statutes of New Jersey. All assessments levied for said improvement shall in each case be as nearly as may be in proportion to and not in excess of the peculiar benefit, advantage or increase in value which the respective lots and parcels of real estate shall be deemed to receive by reason of such improvement. The total amount of the assessments so levied shall not exceed the cost of said improvement. The portion of such cost which shall not be so assessed shall be paid by the City as in the case of a general improvement which is to be paid for by general taxation.

Section 3. It is hereby determined and stated that (1) the City will contribute no part of the cost of said purpose, it being expected that the special assessments levied therefor will equal $ 50,000 and (2) no special assessments for such purpose have been levied or confirmed and (3) such special assessments may be paid in 5 installments.

Section 4. It is hereby determined and stated that (1) the making of such improvement (hereinafter referred to as "purpose") is not a current expense of said City and (2) it is necessary to finance said purpose by the issuance of obligations of said City pursuant to the Local Bond Law of New Jersey and (3) the estimated amount of money necessary to be raised from all sources for said purpose is $ 50,000 and (4) $ 2,500 of said sum is to be provided by the down payment hereinafter appropriated to finance said purpose and (5) the estimated maximum amount of bonds or notes necessary to be issued for said purpose is $ 47,500 and (6) the cost of said purpose, as hereinbefore stated, includes the sum of $ 2500.— , which is estimated to be necessary to finance (a) engineering and inspection costs and legal expenses and (b) the cost of issuing the obligations authorized by this ordinance and (c) interest on such obligations, to the extent permitted by Section 40:1-55 of said Local Bond Law.

Section 5. It is hereby determined and stated that moneys exceeding $ 2,500 , appropriated for down payments on capital improvements or for the capital improvement fund in budgets heretofore adopted for said City are now available to finance said purpose. The sum of $ 2,500 is hereby appropriated from such moneys to the payment of the cost of said purpose.

Section 6. To finance said purpose, bonds of said City of an aggregate principal amount not exceeding $ 47,500 are hereby authorized to be issued pursuant to said Local Bond Law. Said bonds shall bear interest at a rate which shall not exceed six per centum (6%) per annum. All matters with respect to said bonds not determined by this ordinance shall be determined by resolutions to be hereafter adopted.

Section 7. To finance said purpose, Bond Anticipation Notes of said City of an aggregate principal amount not exceeding $47,500 are hereby authorized to be issued pursuant to said Local Bond Law, in anticipation of the issuance of said bonds. Said notes shall bear interest at a rate which shall not exceed six per centum (6%) per annum, and may be renewed from time to time pursuant to and within the limitations prescribed by said Law. All matters with respect to said notes not determined by this ordinance shall be determined by resolutions to be hereafter adopted. In the event that bonds are issued pursuant to this ordinance, the aggregate amount of notes hereby authorized to be issued shall be reduced by an amount equal to the principal amount of the bonds so issued. If the aggregate amount of outstanding bonds and notes issued pursuant to this ordinance shall at any time exceed the sum first mentioned in this section, the moneys raised by the issuance of said bonds shall, to not less than the amount of such excess, be applied to the payment of such notes then outstanding.

Section 8. It is hereby determined and declared that the period of usefulness of said purpose, according to its reasonable life, is a period of forty years computed from the date of said bonds.

Section 9. It is hereby determined and stated that the Supplemental Debt Statement required by said Local Bond Law has been duly made and filed in the office of the City Clerk of said City, and that such statement so filed shows that the gross debt of said City, as defined in Section 40:1-76 of said Local Bond Law, is increased by this ordinance by $47,500, and that the bonds and notes authorized by this ordinance will be within all debt limitations prescribed by said Local Bond Law.

APPROVED
Finance Division

Section 10. This ordinance shall take effect twenty days after the first publication thereof after final passage.

Passed: JUL 15 1952

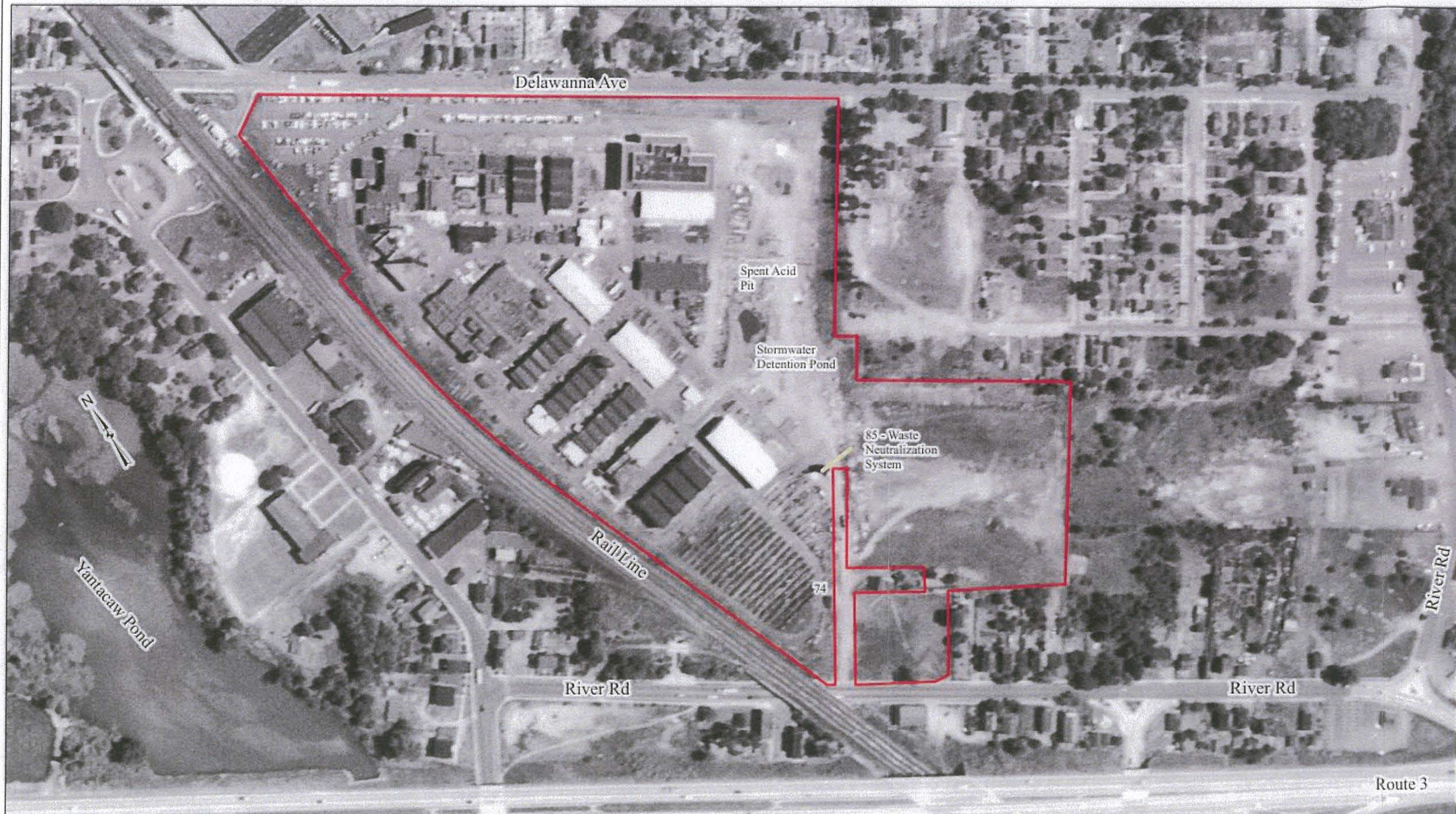
ACTING Chairman of the Municipal Counc

Attest: Edith M. Marrion City Clerk

Approved: City Manager

APPROVED CITY MANAGER

EXHIBIT R



— Site Boundary

0 100 200 400 Feet
1:2,400

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

DATA SOURCES:
1953 Aerial: AR1XI00000900(41-42)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

1953 Aerial Imagery - Site View	Exhibit
Givaudan - Passaic Clifton, NJ	16

1953 – Site View

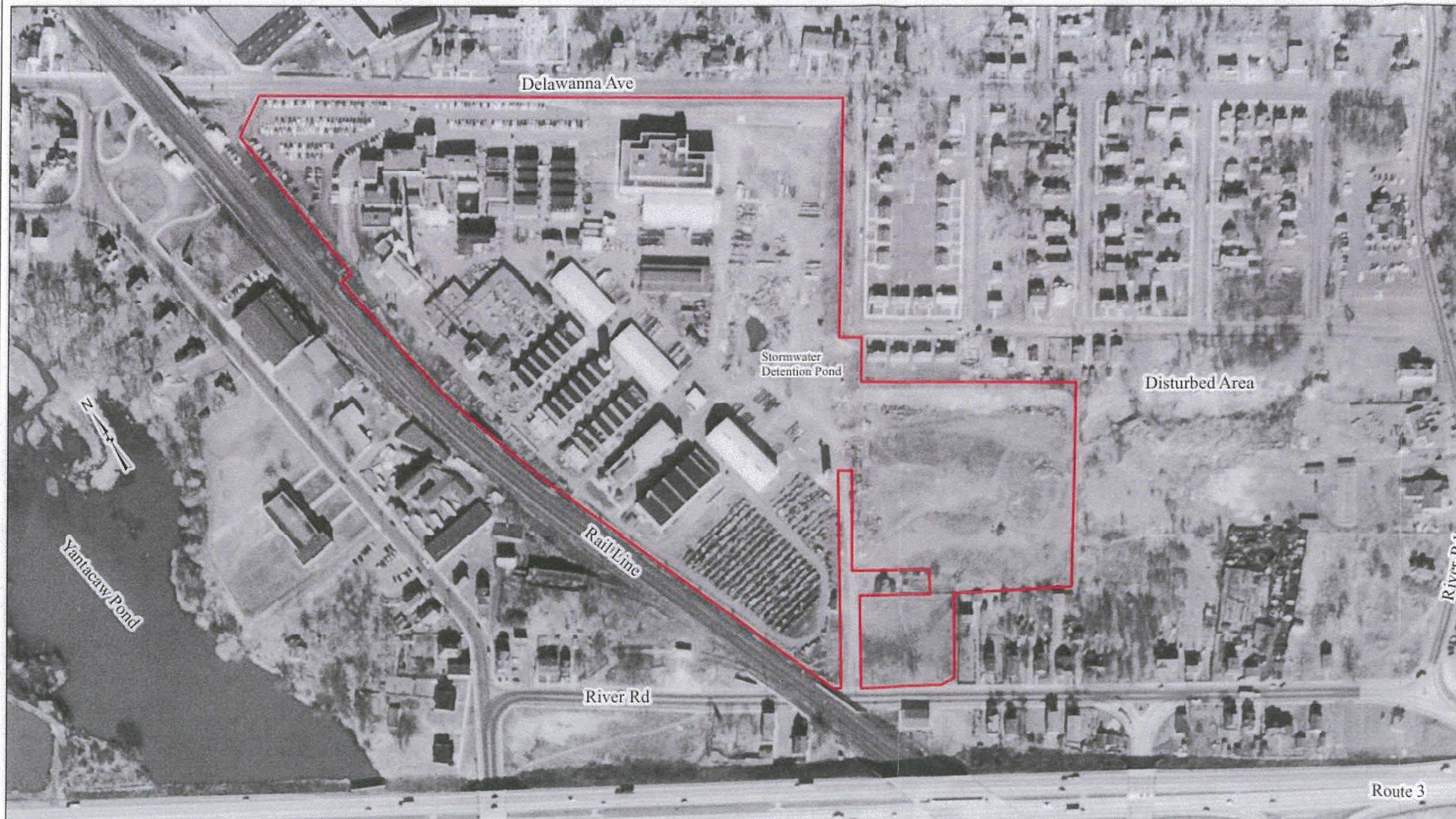
Observed Photograph Features

- New, tall structure (Building 85) present in the south-central portion of the site.
- Paving appears limited to the northern portions of the site, associated with parking.
- Outside storage in several areas continues to expand, including the Process Area.
- The linear surface impoundment (former Spent Acid Pit) next to the stormwater detention pond is not as prominent; there is little, to no, standing water visible.
- No channelized flow or surface drainage features noted on site.

Site Development Notes

- Building 85, identified as the waste neutralization system, is located in the area of the observed small, tall structure. (CFM Plate A, 1983).

EXHIBIT S



Site Boundary

NOTES:
Parcel boundaries are approximate. Parcels 1-7 are represented in this figure.

DATA SOURCES:
1954 Aerial: AR1VCN0000100(43-44)
Property Boundaries: Stewart Title Guaranty Company, Title No. 98-LT-0846, Schedule A, Vesting Schedule, December 1998.

0 100 200 400 Feet
1:2,400

1954 Aerial Imagery - Site View

Givaudan - Passaic
Clifton, NJ

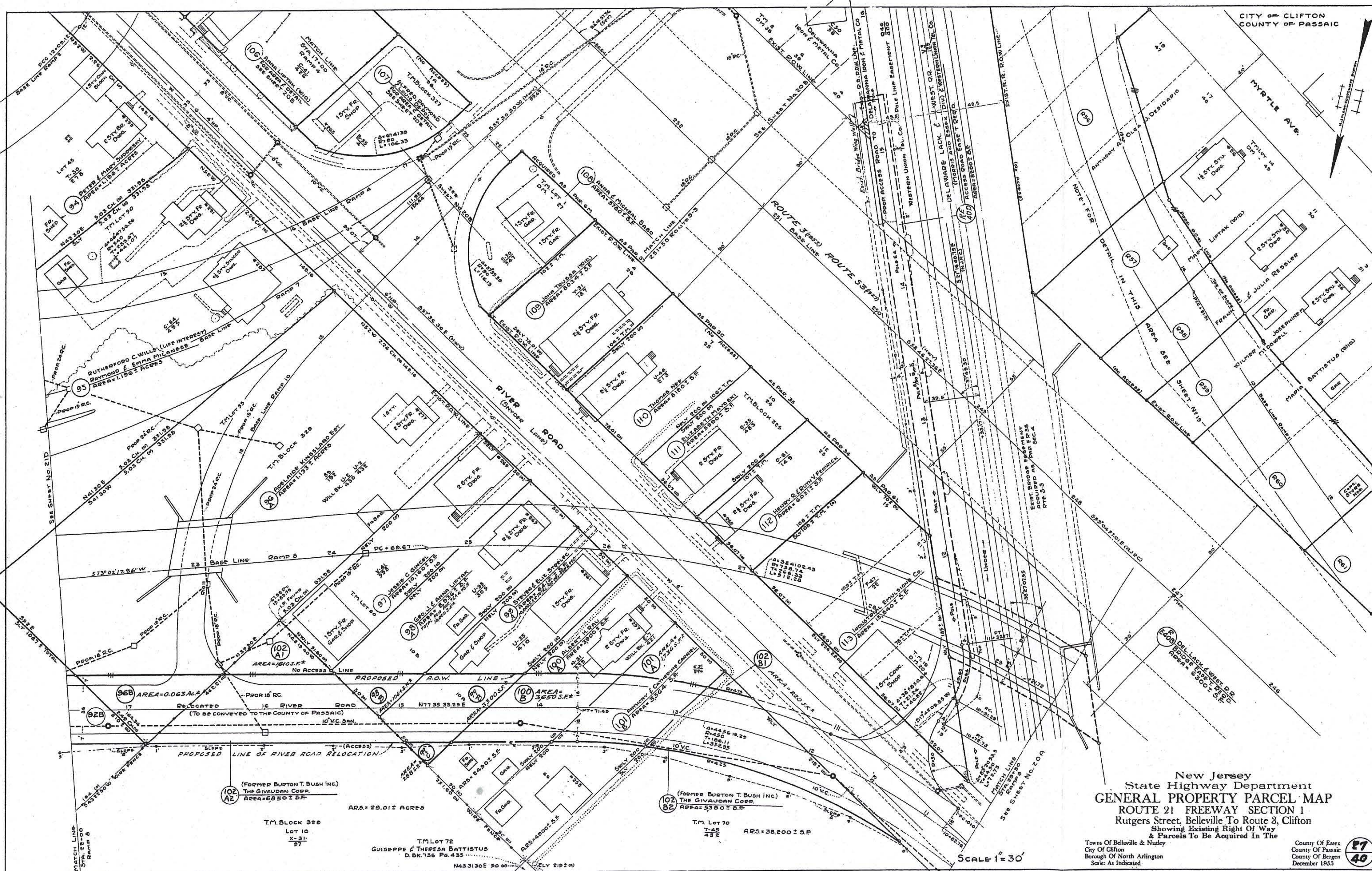
Exhibit
18

1954 – Site View

Observed Photograph Features

- No apparent changes to on-site infrastructure.
- Residential area on eastern side of site developed since 1953, between the site and the Passaic River.
- Linear surface impoundment feature (Spent Acid Pit) no longer present.
- No channelized flow or surface drainage features noted on site.
- Additional outdoor storage around the Stormwater Detention Pond and throughout site.
- Notable disturbed area southeast of site, below residential neighborhood.
- River Road in historical alignment; north/south parallel to the Passaic River to the east of the site.

EXHIBIT T


New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTE 21 FREEWAY SECTION 1
Rutgers Street, Belleville To Route 3, Clifton
Showing Existing Right Of Way
& Parcels To Be Acquired In The
Towns Of Belleville & Nutley
City Of Clifton
Borough Of North Arlington
Scale: As Indicated
County Of Essex
County Of Passaic
County Of Bergen
December 1955
27
40
SCALE 1" = 30'
CITY OF CLIFTON
COUNTY OF PASSAIC
RIVER ROAD
(SNYDER LANE)
MYRTLE AVE.
ROUTE 3 (1953)
ROUTE S3 (1927)
PROPOSED LINE OF RIVER ROAD RELOCATION
RELOCATED RIVER ROAD
(TO BE CONVEYED TO THE COUNTY OF PASSAIC)
(FORMER BURTON T. BUSH INC.)
THE GIVAUDAN CORP.
AREA = 6850 ± S.F.
AREA = 5380 ± S.F.
T.M. BLOCK 328
LOT 10
T.M. LOT 72
GUISEPPE & THERESA BATTISTUS
D. BK. 736 PG. 435
INDUSTRIAL EMULSIONS CO.
DEL. LACK. & WEST. R.R.
21-245